the OIL AND GAS JOURNAL

HUGHES
TOOL COMPANY
HOUSTON, TEXAS
WORLD STANDARD OF THE INDUSTRY

As a leading manufacturer of tool joints, Hughes Tool Company has found that with few exceptions, tool joints serve a full, useful life without trouble of any kind. We realize these few exceptions may result in costly repairs and occasional fishing jobs. To help in reducing this expense, the Hughes Tool Company has prepared a brochure on "Care and Operation of Tool Joints" illustrating the symptoms of the more common troubles so that they may be recognized early and steps taken to minimize failures. The Hughes Tool Company will gladly send you a copy of this brochure upon request.

PRICE 50 CENTS TABLE OF CONTENTS PAGE 51 **MAY 12, 1949**

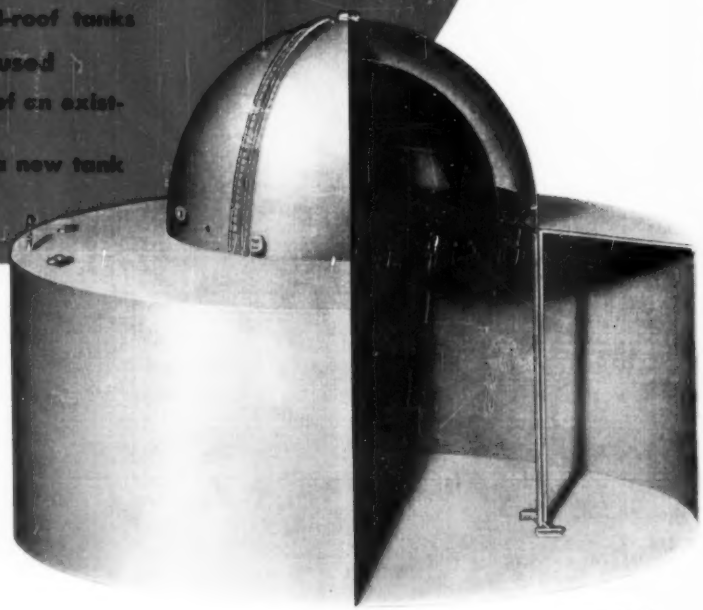
Now there is another way to stop evaporation losses—

use the new Horton
VAPORDOME ROOF

provides an expansible vapor space for one or more fixed-roof tanks

designed to be used

- **as a new roof of an existing tank**
- **as the roof of a new tank**



Patent applied for

THE Horton Vapordome Roof is a brand new addition to the Horton line of vapor-saving structures. It is designed for installation on flat-bottom tanks, as shown in the cutaway view at the right, and can be used to prevent evaporation loss of volatile products stored in a single tank, or in a group of interconnected tanks. The dome of the roof contains a flexible hemispherical membrane that "breathes"—allowing the air-vapor mixture above the stored liquid to expand and contract when the temperature changes without being vented and lost.

In operation, the Vapordome Roof is similar to the Vaporsphere. The Vapordome Roof can, however, be installed more economically as the roof of a new tank, when re-roofing an existing tank, or when there is no ground space for a Vaporsphere. Write our nearest office for complete engineering data.

Advantages . . .

- Easily installed as the roof of a new tank or the roof of an existing tank. Needs no ground space.
- Operates dependably in any climate. All moving parts are enclosed.
- Operates without cost, aside from ordinary maintenance.
- Operates at low pressure—interconnected tanks do not require reinforcement.
- Tanks can be added to or disconnected from vapor-saving system without taking Vapordome out of service.
- Extremely low fire hazard from either internal or external sources.

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1556 North 50th St.
Boston, 10.....1625-201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Havana.....402 Ahrex Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 14.....1523 General Petroleum Bldg.
New York, 6.....3347-165 Broadway Bldg.
Philadelphia, 3.....1615-1700 Walnut Street Bldg.
Salt Lake City, 1.....1525 First Security Bank Bldg.
San Francisco, 11.....1254-22 Battery Street Bldg.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1006 Hunt Bldg.

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Compania Tecnica Industrie Petroli, S.A.I., Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Chicago Bridge & Iron Company, Limited, Apartado 1348, Caracas, Venezuela

The article with the lowest price tag can be tempting, can look like a bargain. Yet another brand, with a higher first cost, may be far more economical in the end — because of the longer, better service it gives.

You may find sometimes that Bethlehem wire rope is a bit higher in first cost than some other brand; but on the basis of long-range economy — *true* economy — we invite you to compare it with anybody's product, any place, any time.

Bethlehem has one of the finest, most modern rope mills in the world; a staff of engineers whose sole object is to build longer life and better service into Bethlehem ropes; and a field organization whose job is to study rope trends and rope uses in every industry. All this adds up to one thing — quality; the type of quality that in wire rope means Lower Cost per Unit of Work.

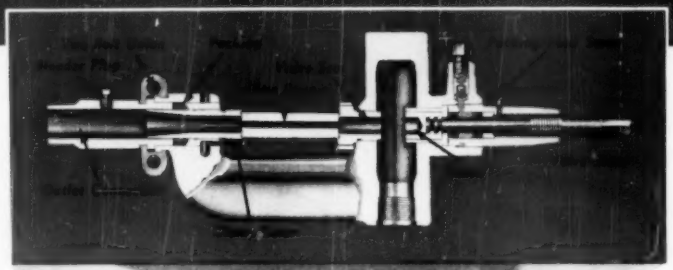
And that's the only real yardstick — the only *real* measure of economy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

THE INDUSTRY'S FIRST UNITIZED XMAS TREE
FLOW WING, AND STILL THE INDUSTRY'S CHOICE

Cameron TYPE "D" FLOW WINGS



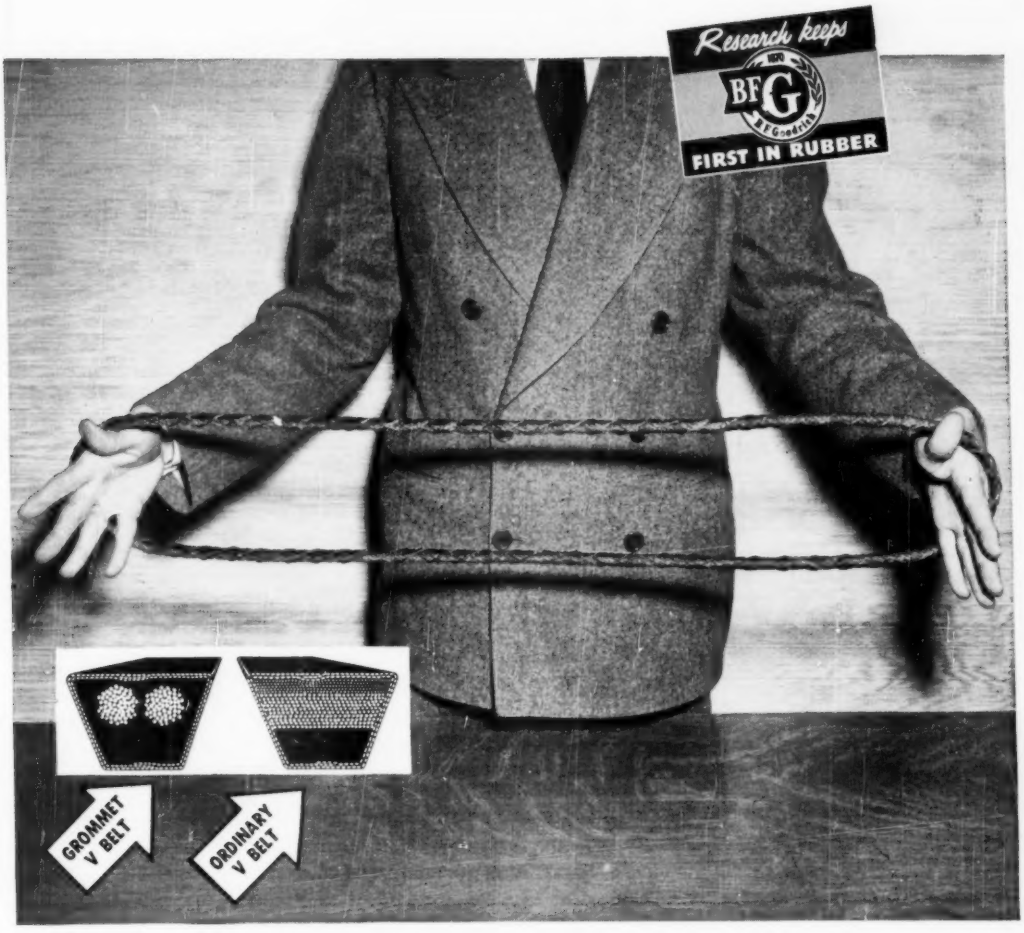
Here, in a single compact unit, are all essential fittings required for a Christmas tree wing: An easily operable valve, a positive choke, an efficient 2-bolt flowline union and a bleeder plug to release pressure trapped in the line. Note how the positive choke section of the unit is so easy to get to . . . no cage nipple, threaded or flanged connections, or bean wrenches are required for choke changing. This operation is fast, safe and simple.

These efficient Cameron Flow-Wings may be incorporated in any manufacturer's Christmas tree. They are as interchangeable as a valve, pressure gauge or any other fitting.

Cameron Flow-Wings are available in both low pressure threaded models and with API flanged connections in test pressures ranging up to 15,000 lbs. Complete details are carried in your Composite Catalog or literature will gladly be sent to interested operators on request.

Cameron
IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS

Export:
74 Trinity Place New York, N. Y.



A grommet is not a cable

New B. F. Goodrich grommet V belts cut costs 20 to 50%

A GROMMET is made by winding heavy cord upon itself to form an *endless* loop. Don't confuse it with an ordinary cable, which is merely a twisted cord, the ends of which must overlap to make a loop. The B. F. Goodrich grommet V belt combines all of the load-carrying cord into twin endless grommets, saves belt costs by working better, lasting longer.

Grommet belts are more flexible—They have no splice, no stiff section where cords overlap (85% of failures of ordinary belts occur in overlapped sections). BFG belts have twin grommets, no fabric or plies in the middle of the belt that stiffen it and generate heat. They have more *elasticity*, less permanent stretch than any other belt.

Stand shocks better—Actual running tests in field and laboratory show that BFG grommet V belts have a higher safety factor, much greater ability to withstand shock load than do ordinary V belts—actually lasted 20 to 50% longer!

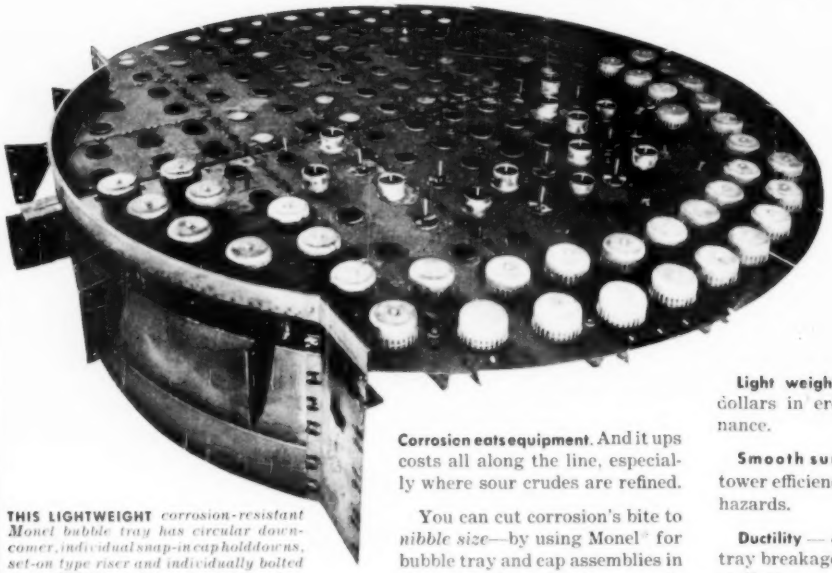
No "lost" cords—In an ordinary V belt much of the cord strength is lost—wasted in the center of the belt where the cords don't pull their share of the load. In a grommet belt *all* the cords work *all the time*. There are no center cords.

Only BFG has the grommet belt—Twin grommet construction is an exclusive, patented B. F. Goodrich development (U. S. Patent No. 2,233,294). To make sure you get genuine grommet V belts, (for the present made only in the larger—the D and E sizes), see your local distributor. (He also has a full line of light-duty belts for industrial needs.) *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F.Goodrich

Lightweight MONEL Bubble Trays and Caps

RESIST CORROSION
REDUCE COKING
CUT EXPLOSION DAMAGE



THIS LIGHTWEIGHT *corrosion-resistant Monel bubble tray has circular downcomer, individual snap-in cap holddowns, set-on type riser and individually bolted caps. Holddown frogs snap into riser openings, and can be installed or removed from top of deck.* PHOTO COURTESY OF THE FABRICATOR, FRITZ W. GLITSCH & SONS, DALLAS, TEXAS.

Corrosion eats equipment. And it ups costs all along the line, especially where sour crudes are refined.

You can cut corrosion's bite to *nibble size*—by using Monel* for bubble tray and cap assemblies in the top sections of primary crude towers.

In these sections where, at temperatures below 500° F., dilute hydrochloric acid plays havoc with most materials, Monel offers an ideal economical solution. Monel's resistance to corrosion attack promotes a lasting, smooth, coke-resisting surface. Its high strength and low corrosion rate make possible the use of thin, lightweight sections which save you money both in material costs and in tower design.

The Glitsch "Truss-Type" bubble tray illustrated above makes possible these advantages of wrought Monel construction . . .

Light weight—saves time and dollars in erection and maintenance.

Smooth surfaces—increases tower efficiency . . . lessens coking hazards.

Ductility—eliminates cap and tray breakage in cleaning and installation.

Safety—the light weight and ductility of Monel trays allow minor explosions and pressure surges within the tower to expend themselves without damage to the vessel. They greatly reduce the hazard to workers entering a vessel which has undergone an explosion. And Monel trays and caps, distorted by an explosion, may be easily straightened in the field and returned to service.

So before you choose any metal for cap and tray assemblies, consider the advantages of Monel. Write for information and technical data relating to Inco Nickel Alloys in refining equipment.

EMBLEM OF SERVICE

INCO

TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

*Reg. U. S. Pat. Off.

MONEL . . . *for minimum maintenance and replacement*

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1949.

7 Years ...NO REPAIRS!

SS Unit Pump on 24 hour, intermittent 7 day duty in power plant gives equivalent of 20 years normal service with *no* repair cost, *no* lost time

SINCE EARLY 1942 this SS Unit pump has been on continuous duty in a large mid-west plant. Never once in all this time has it failed to operate perfectly. Outside of normal repacking, not one cent has been spent on repair.

Here's *proof* that the extra-strong design, extra-heavy construction and extra-quality manufacture of Allis-Chalmers pumps give you dependable performance and low pumping costs.

Compare SS Unit features with any similar pump. Notice how SS Unit is compact, yet open for easy maintenance. Motor and pump are solidly bolted together using the same shaft. This design holds alignment rigidly . . . reduces vibration . . . cuts wear and tear. Every A-C pump is tested at the factory. Full rated efficiency and output are *guaranteed*.

SS Unit is one of many Allis-Chalmers pumps for industrial service. For complete information, see your Allis-Chalmers Authorized Dealer or Sales Office, or write for Bulletin 52B6059E. Also in Sweet's.

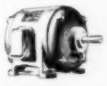
SS Unit, Texrope and Vari-Pitch are Allis-Chalmers trademarks A-2660

ALLIS-CHALMERS, 1059A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

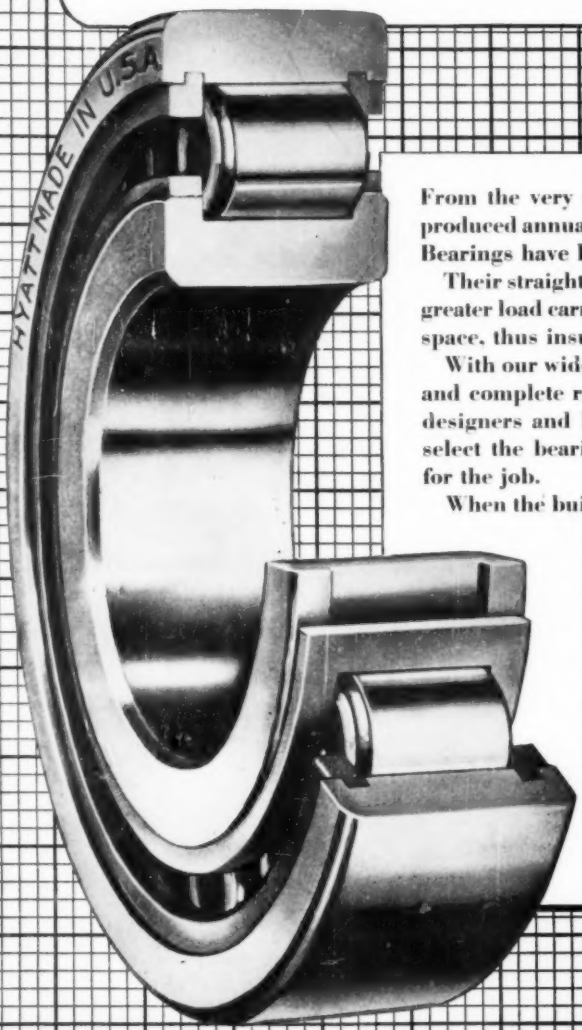


MOTORS — ½ to 25,000 hp and up. All types

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

BUILT FIRST –TO LAST



From the very first to the millions now produced annually, Hyatt Hy-Load Roller Bearings have been built to last.

Their straight radial construction offers greater load carrying capacity, in a limited space, thus insuring longer bearing life.

With our wide variety of bearing types, and complete range of sizes we help the designers and builders of machinery to select the bearings most perfectly fitted for the job.

When the builders of equipment select Hyatts, they avail themselves of bearing application "know-how" accumulated by Hyatt engineers during more than half a century devoted to improving the equipment you use with better antifriction bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

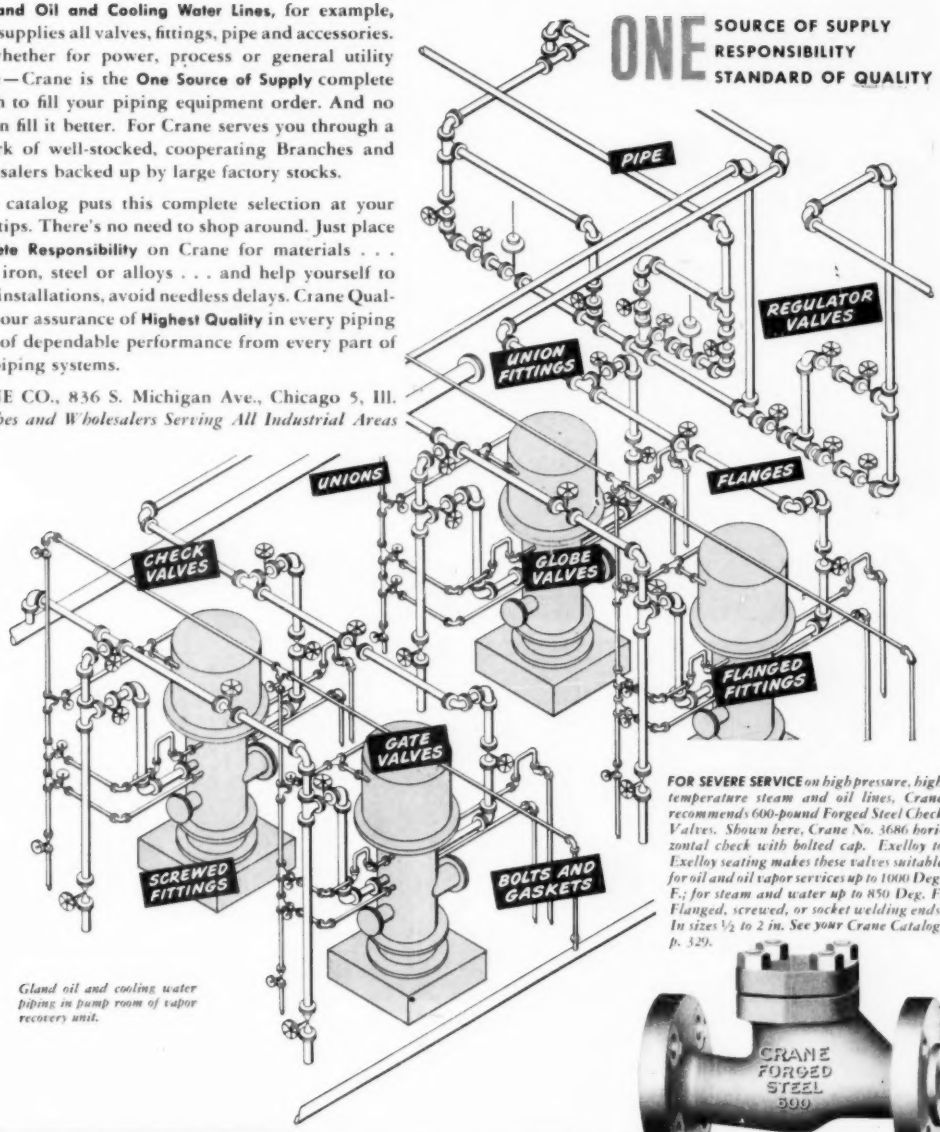
For every refinery piping job
It's CRANE for complete selection

For Gland Oil and Cooling Water Lines, for example, Crane supplies all valves, fittings, pipe and accessories. But, whether for power, process or general utility service—Crane is the **One Source of Supply** complete enough to fill your piping equipment order. And no one can fill it better. For Crane serves you through a network of well-stocked, cooperating Branches and Wholesalers backed up by large factory stocks.

One catalog puts this complete selection at your finger tips. There's no need to shop around. Just place **Complete Responsibility** on Crane for materials . . . brass, iron, steel or alloys . . . and help yourself to better installations, avoid needless delays. Crane Quality is your assurance of **Highest Quality** in every piping item—of dependable performance from every part of your piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



Gland oil and cooling water piping in pump room of vapor recovery unit.

FOR SEVERE SERVICE *on high pressure, high temperature steam and oil lines, Crane recommends 600-pound Forged Steel Check Valves. Shown here, Crane No. 3686 horizontal check with bolted cap. Exelloy to Exelloy seating makes these valves suitable for oil and oil vapor services up to 1000 Deg. F.; for steam and water up to 850 Deg. F. Flanged, screwed, or socket welding ends. In sizes ½ to 2 in. See your Crane Catalog, p. 329.*

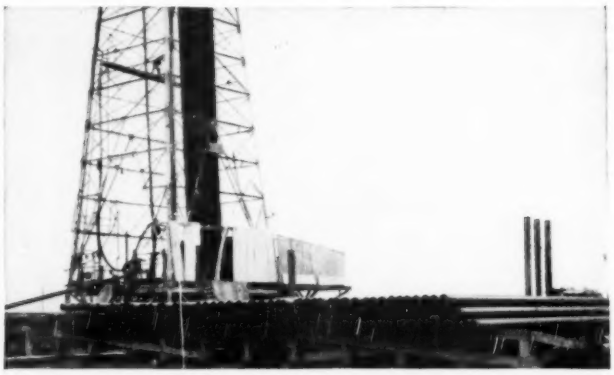
EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

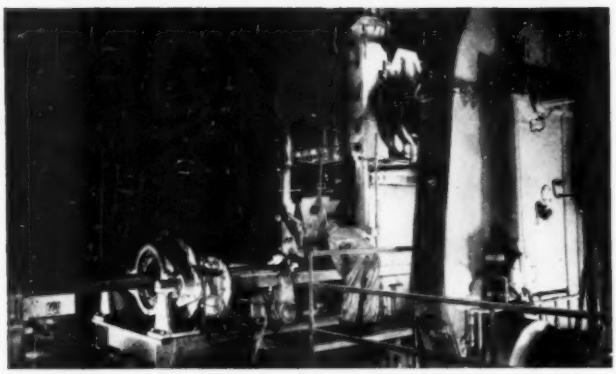
CRANE

FOR EVERY PIPING SYSTEM

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING



IN THE FIELD, LOUISIANA: Running a 9200-foot string of 9⅝-inch S-80 SMITHway Casing.



IN THE A. O. SMITH PIPE MILL: Research developed this special Smith-designed cold compression machine for externally sizing SMITHway Casing

A.O. SMITH STEEL PIPE MILL 75th ANNIVERSARY 1874 1949

SMITH*way* CASING · LINE PIPE

A. O. SMITH CORPORATION

New York 17 • Pittsburgh 19 • Atlanta 3 • Chicago 4 • Tulsa 3 • Dallas 1
Houston 2 • Seattle 1 • Los Angeles 14 • International Division: Milwaukee 1

The MURPHY DIESEL

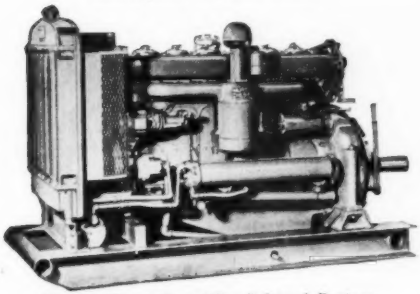
is built for heavy-duty, continuous service!

the Murphy Unit Injector

. . . heart of the MURPHY DIESEL

A simple dependable unit injector for each cylinder serves as both pump and nozzle and eliminates all high pressure fuel lines.

Above, right—Two 150 H. P. continuous, 180 H. P. intermittent, Murphy Diesels power this mud pump. Three other Murphy Diesels are used to power the draw works.



Murphy Heavy Duty "True" Diesel Engines and Power Units 90 to 190 H.P.

Generator Sets 60 to 116 K.W., A.C. or D.C.

it's a "True" diesel

By utilizing maximum power in the fuel, the "true" diesel operating principle—solid fuel injected directly into a plain open combustion chamber—makes it possible for the Murphy Diesel to deliver more heavy-duty power, continuously. The absence of pre-combustion and pre-mixing chambers reduces turbulence within the cylinder, conserving the heat of compression for immediate ignition and controlling temperatures of pistons, valves and cylinder liners to reduce wear.

Such features as unit fuel injection . . . four valves per cylinder . . . flywheel end cam drive . . . oil cooled pistons . . . and through tie bolts further insure Murphy Diesels' ability to fulfill the toughest sustained heavy-duty power requirements.

Have your Murphy Diesel Dealer give you all the facts today—and ask him for a copy of the booklet "7 Questions to Ask a Diesel Engine Salesman".

MURPHY DIESEL COMPANY

5305 West Burnham Street Milwaukee 14, Wisconsin

MURPHY DIESEL

LOWEST ULTIMATE POWER COST

FACTORY BRANCH—SALES, PARTS and SERVICE
113-17 SOUTH ELWOOD STREET, TULSA, OKLAHOMA

Lift Oil for Less with Axelson PRODUCTION EQUIPMENT

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

PLUNGER PUMPS

Axelson's complete line of plunger pumps will help you solve—economically—problems involving gravity, gas volume, water, corrosion, stroke length, speed, power.

RODS & COUPLINGS

Let Axelson's years of field and manufacturing experience help you lick unprofitable down-time and fishing. Here are rods built to stand corrosion, fatigue and shock.

POLISH RODS & STUFFING BOXES

Here's a combination that lasts and lasts. Box is simple in design, rugged, has integral oil reservoir, is easily adjusted. Polish rod is accurately threaded and of special heat treated alloy.

BALLS & SEATS

Made from Axelson's own alloys, balls and seats are specially designed to meet all conditions of depth, corrosion, pressure, abrasion and magnetism.

Never Junk an Axelson Pump

Below, one of the many well equipped and expertly manned Axelson pump repair shops maintained by the Jones & Laughlin Supply Company. Use these facilities. They mean longer service and more profit from your Axelson equipment.

You'll find the personnel of your nearby Jones & Laughlin Supply store enthusiastic about Axelson production equipment. For one thing Axelson has been "at it" since 1892. They know production problems—and have developed special alloys and techniques to combat them.

No matter what difficulty you're having, take it to your Jones & Laughlin Supply store. You'll be pleased with the expert service you receive and you'll be money ahead on the proper solution to your production problem.

Export: 230 Park Ave., New York 17, N. Y., U. S. A.

JONES & LAUGHLIN SUPPLY COMPANY

Subsidiary of Jones & Laughlin Steel Corporation

J&L STEEL

TULSA, OKLAHOMA

Drill site on a hillside

Drillers having a "Caterpillar" track-type Tractor and "Caterpillar" Bulldozer at hand are seldom stuck with location problems or long delays in "gittin' thar and riggin' up." They find it just about the handiest and "payingest" utility tool a drilling project can call for.

With brutish power, amazing maneuverability, and traction that's virtually unyielding, it can climb mountains, wade swamps, work in all kinds of weather. And with fuel obtainable from the very industry it serves, it can pitch in any time anywhere on such jobs as:

1. *Leveling drilling sites.*
2. *Digging slush pits and oil-well sumps.*
3. *Constructing and maintaining haul roads.*
4. *Building fire walls.*
5. *Moving rigs and hauling supplies and materials.*
6. *Removing snow and cleaning up.*

And readily available for keeping "Caterpillar" equipment "fit as a fiddle" is a dealer service organization widely regarded as the most complete of its kind in the world.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

•

CALIFORNIA – *Benching out a drill site on a steep, high hillside with a "Caterpillar" D8 equipped with an 8S Bulldozer and double-drum rear-mounted No. 25 Cable Control. Its owner, Bennett Murray, has a total of seven D8s and two D4s.*

CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

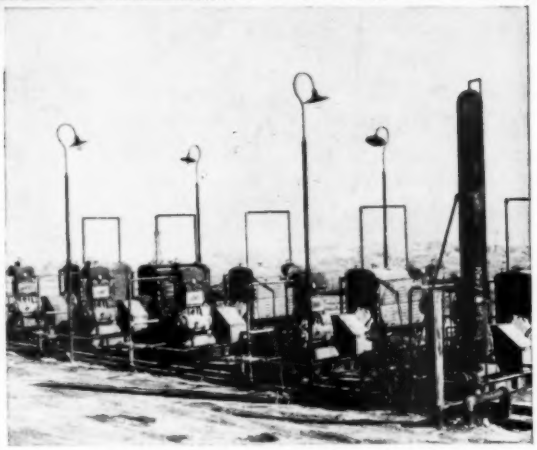
IMPROVE YOUR PRODUCTION . . .

AVOID MECHANICAL SHUTDOWNS!

MINNEAPOLIS-MOLINE
MM
MODERN MACHINERY

POWER UNITS

SUPPLY DEPENDABLE, LOW COST POWER



The surest way to maintain steady high-level production is through dependable uninterrupted power. Minneapolis-Moline engines for oil field power have built an enviable record for continuous duty without mechanical shutdowns.

Low cost installations of MM heavy-duty engines that provide 25 to 230 h. p. offer exceptional maintenance economy and long engine life. In addition you get these MM exclusive features: *crankcase ventilation, heat exchanger base pans, high-turbulence combustion chambers, regulated cooling, by-pass thermostats, removable cylinder heads and blocks, extra large bearing surfaces, replaceable bearing shells that are steel-backed and precision made, water-cooled manifolds,* and many others.

You, too, will agree that Minneapolis-Moline engines are quality constructed and skillfully engineered for heavy-duty performance in oil field operations.

DISTRIBUTED BY . . .

SHRIMPTON MFG. SUPPLY CO.

2700 S. Eastern Avenue
Los Angeles 22, California

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Kilgore, Texas

219 So. Pennsylvania Ave.
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6617 Snider Plaza
Dallas, Texas

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

TO MEET FIELD CONDITIONS...

"Buy From Bovaird"

To help your field superintendents and foremen solve their operating problems, our store managers and field representatives are qualified to give expert advice and recommendations on new developments in equipment, processes and methods. We suggest you have your men discuss drilling, production, pipe line and refining supply needs at Bovaird stores.

BOVAIRD SUPPLY COMPANY

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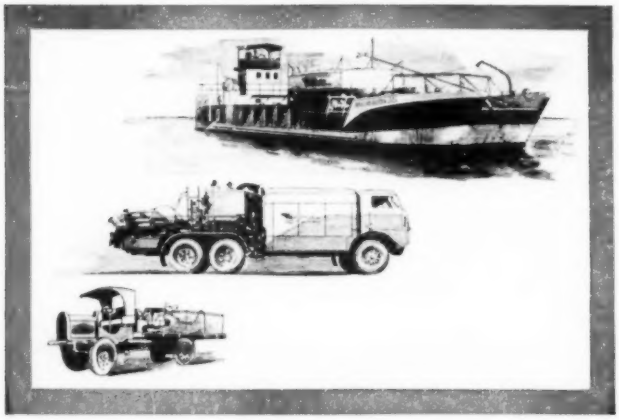
THE BOVAIRD SUPPLY CO.

GENERAL OFFICES: TULSA, OKLAHOMA

THE YARDSTICKS OF OIL FIELD SERVICE



Progress

Drilling progress is a story of teamwork—a record of cooperation between drillers, producers, manufacturers, suppliers and service organizations.

For a quarter of a century drillers and producers—the men who call the signals—have relied on Halliburton to carry the ball of cementing progress.

Never in that period has Howco relaxed its program of development; never, as they went deeper and deeper in their search for oil, have operators failed to find Halliburton ready with the required equipment and techniques.

The creation, early in the game, of a revolutionary method of mixing cement, the evolution of cementing equipment, advancement of cementing methods and introduction of bulk cementing are all part of the assignment. So also is the development of marine units for offshore operations.

The record would seem to indicate that the position assigned to Halliburton on the team of drilling progress has been well fulfilled.

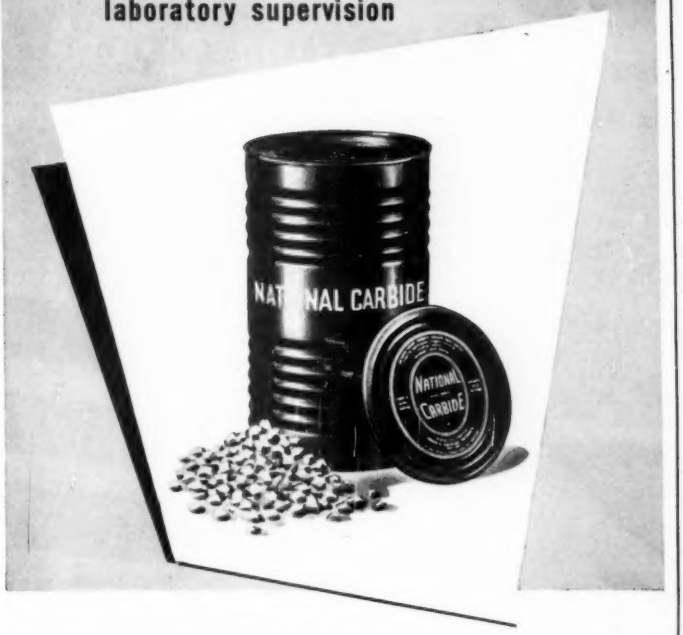
Halliburton

OIL WELL CEMENTING COMPANY

THERE IS NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING

For high acetylene yield . . . specify National Carbide

produced under laboratory supervision



Rigidly controlled and tested during manufacture . . . and produced from the finest lime and coke available, "*National Carbide*" (meeting all Federal Specifications) assures every customer an exceptionally high acetylene yield per pound of carbide — a minimum 4½ cu. ft. This high quality, plus careful adherence to a special packaging technique accounts for "*National's*" wide acceptance as the Carbide producing maximum acetylene production . . . at lowest operating cost.

Also, and of vital importance to you, no matter where your plant is located, "*National Carbide*" can be obtained in any quantity from a nearby Airco office, authorized dealer, or warehouse.

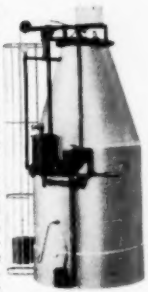
For more information about this top-grade product, write your name and address on the margin below, and send it to your nearest Airco office or authorized dealer for a copy of Catalog 30.

* * *

Magnolia Airco supplies Oxygen, Acetylene and other industrial gases . . . Carbide . . . and a complete line of gas cutting machines, gas welding apparatus and supplies, plus arc welders, electrodes and accessories. Ask us about anything pertaining to gas welding and cutting, and arc welding . . . we'll be glad to help you.

More news about AIRCO products

STATIONARY ACETYLENE GENERATORS



Airco's 300 pound (double rated — 600 cu. ft. per hr.) and 500 pound (double rated — 1,000 cu. ft. per hr.) stationary acetylene generators are suitable for operating all types of welding or cutting torches.

Automatic in principle, these generators feature hot galvanized shells — inside and out, with all welded seams. Operating parts have been reduced to a minimum — and are easily accessible for inspection or repair.

Also included as standard equipment are "protectomotor filters" to entrap suspended lime, and prevent clogging acetylene pipe lines, regulators and torches.

PORTABLE ACETYLENE GENERATORS

The Airco Type "P" portable actylene generator is designed and constructed for efficiency, convenience, dependable and low-cost operation . . . and requires little attention other than draining and refilling with carbide and fresh water. Other features include:

—Quick, easy charging
—"Air Lift" principle of water circulation
—Glass viewing window in carbide hopper
—Simple and conveniently located controls
—Large-size sludge agitator and valve for complete and fast sludge removal.

Made in three sizes, each approved for double-rated operation: 15-lb. size, 30 cu. ft. per hr.; 30-lb. size, 60 cu. ft. per hr.; and 50-lb. size, 100 cu. ft. per hr.

All Airco generators conform with the specifications of Underwriters' Laboratories and Factory Mutual.

MAGNOLIA AIRCO GAS PRODUCTS CO.

Houston • Beaumont • Corpus Christi • Wichita Falls
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Driller's Choice
FAST SAFE

BREWSTER
HEAVY DUTY TRAVELING BLOCKS

Brewster sheaves are cast electric alloy steel. Machined grooves are flame hardened for greater wear, longer life. Each sheave is mounted on double-row tapered roller bearings for greater stability. Sheaves are individually lubricated through center pin.

PERFECT BALANCE

STRAIGHT FALL

SAFE SMOOTH DESIGN

A SIZE FOR ANY DEPTH

Capacities from 90 to 300 tons.

MODEL HD-542 300 tons

MODEL HD-436 200 tons

For fast, safe, dependable performance, Brewster Heavy Duty Traveling Blocks are preferred everywhere. Their straight line travel without weave or wobble means longer life for drilling lines. Streamlined shape—no dangerous projections. Write today for full information.

MODEL HD-330 90 tons

Sold by:
APEX EQUIPMENT CO.
BOYARD SUPPLY CO.
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BAIRD SUPPLY CO.
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The BREWSTER CO., Inc.

Manufacturers of Drilling Equipment Since 1910

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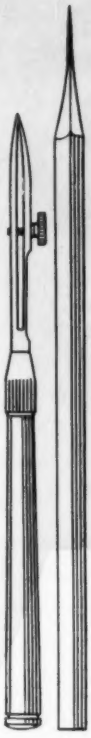

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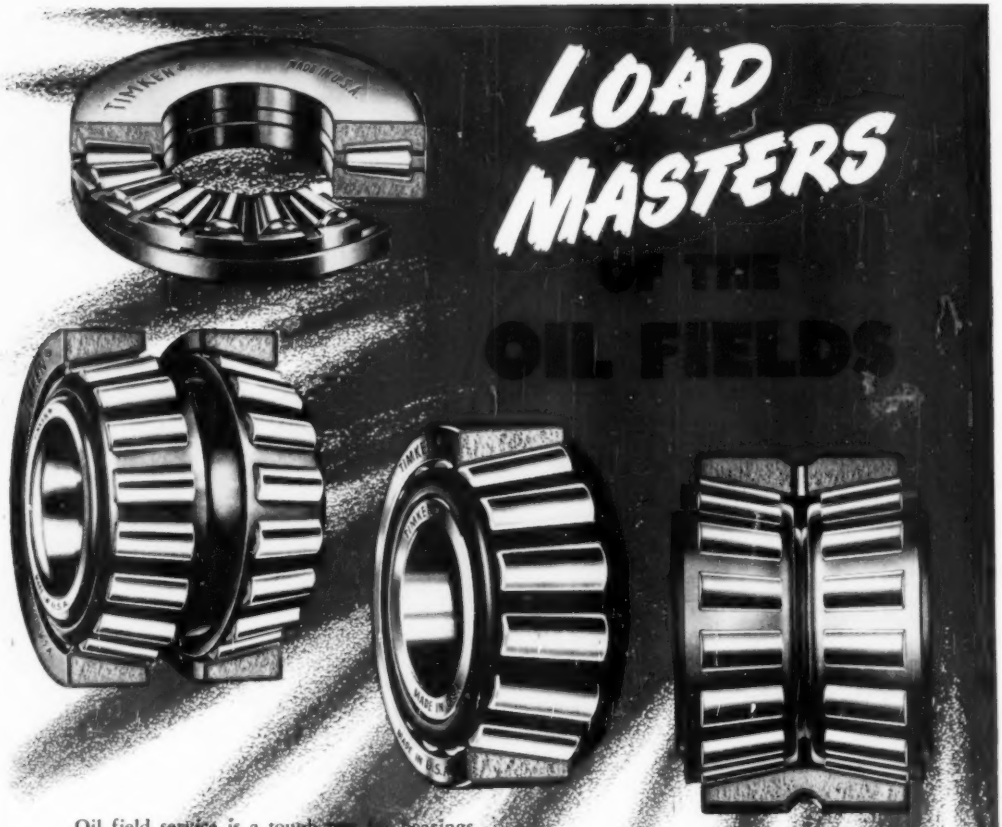
FOR EVERY PLAN YOU MAKE — — — THERE'S A PAPER BY POST



Oil field service is a tough one for bearings. Heavy loads, severe shocks, continuous operation, high speeds all take their toll. That's why more Timken tapered roller bearings are used in oil field equipment than any others — and have been for many years.

Timken bearings keep rotating parts turning smoothly, frictionlessly because of their scientific design; precision manufacture; and extremely high finish of contacting surfaces.

They carry maximum loads — radial loads, thrust loads and both together in any combination because of their tapered construction and the line contact of rolls and races.

They last longer because they are made of Timken alloy steel — the finest material ever developed for tapered roller bearings — heat treated and case hardened to provide the greatest possible resistance to stress and wear.

The Timken bearings that go into your equipment today embody 49 years of continuous refinement. There is no substitute for this experience. Look for the trade-mark "TIMKEN" on every bearing.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY
Canton 6, Ohio · Cable Address "TIMROSCO"

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳

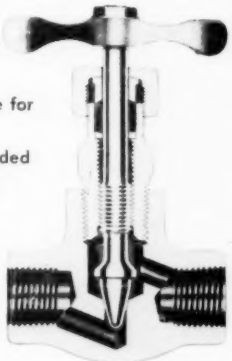
on your gage, meter and instrument lines . . .

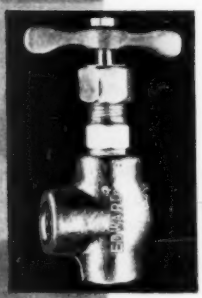
WIPE OUT "NUISANCE MAINTENANCE" *with* EDWARD *FORGED STEEL* GAGE VALVES

YOU'LL FIND MANY ADVANTAGES in Edward forged steel gage valves over bar stock valves for instrument and meter lines, pump vents, Diesel and gas engines.

Here are eight important ones . . .

1. Forged steel bodies for extra strength.
2. Long taper semi-needle stem for close regulation.
3. Extra broad seat joint for tight seating.
4. Contoured T handle for easy operation.
5. Safety *taper* threaded joint prevents bonnet backing out of valve.
6. Hardened stem, lengthens life.
7. Bonnets and packing nuts EValized to reduce abrasion and corrosion.
8. Priced competitively with less strong "bar stock" valves.





Edward globe and angle gage valves are built in three metals—carbon steel, all parts 13% chrome stainless steel, or all parts 18-8 stainless steel, sizes ⅛"-1". Conservatively rated at 4000 lb at 150 deg. or 600 lb at 750 deg. Write for Catalog No. 103.

Edward Valves, Inc.

SUBSIDIARY OF ROCKWELL MANUFACTURING CO.

EAST CHICAGO, INDIANA

You can depend on Hewitt

Your efficiency will go up, and your operating costs will go down when you use Hewitt Rotary Drilling Hose. This dependable hose is built to withstand extreme pressure . . . to resist the deteriorating action of abrasive drilling muds . . . to ward off the harmful softening and swelling effects of oil.

Hewitt Hose

Hose...whatever your job

It's engineered to meet the specific needs of the oil industry!

You name the job. Then let Hewitt show you real hose performance!

Hewitt Hose is engineered by men who *know and understand* the problems you face in handling petroleum and its products.

These men have applied this knowledge to the development of better hose for use in your drilling, refining or distributing operations.

No other hose assures you of greater efficiency! No other hose assures you of greater economy!

Why not check into Hewitt Hose today? When you do, you'll find you can depend on this hose—whatever your job. For complete information, write Hewitt Rubber Division, 240 Kensington Ave., Buffalo 5, N. Y.

Other reasons why petroleum men use Specialized Hewitt Hose

Field Assistance. Trained field specialists know your product, your operations and your problems. They will help you select the *right* hose.

Field-Tested. So that you get a product that's really dependable, Hewitt Hose is tested *in the field*. This supports exhaustive laboratory testing. In fact, Hewitt research never stops.

Field-Proved. Hewitt has the most impressive list of successful "firsts" in new hose development for the oil industry. These have helped increase petroleum-handling efficiency.

CHECK THIS LIST FOR THE SPECIALIZED HOSE YOU NEED

At the derrick

Rotary Drilling Hose
Flexible Vibration Hose
Mud Pump Suction Hose

At the refinery

Oil Suction and Discharge Hose
Sea Loading Hose
Barge Loading Hose
Fire Hose
Flue Cleaning Hose
Steam Hose

At the distribution point

Tank Car Hose
Tank Truck Hose
Fuel Oil and Distillate Hose
Gasoline Pump Hose

Also Propane-Butane Hose for handling liquefied petroleum gases.

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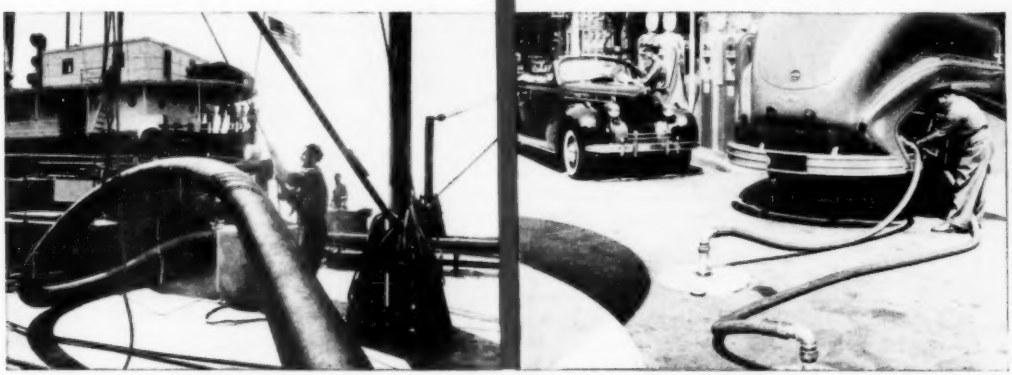
Cut loading and unloading time as much as 50% with Hewitt Oil Suction and Discharge Hose. It has a securely bonded smooth bore that makes it faster . . . easier to drain. Unlike ordinary types, it has no flow-retarding internal spiral of steel wire. Light in weight!

For faster delivery service, use Hewitt Tank Truck Hose. It's oil-resistant inside and out. The synthetic, smooth-bore tube of Hewitt Tank Truck Hose keeps friction drag to a minimum . . . assures faster flow. And special hose construction provides longer, more useful hose life.



for the Oil Industry

So they shall know good music of all nations

Casey Jones, Paul Bunyan, Pecos Bill, Johnny Appleseed . . . all the legendary heroes of America are this year coming to life for children in 2,663 schools through the music of the Standard School Broadcast.

Each week, this program plays and explains good music for an estimated 400,000 classroom listeners. Title of the current course is "American Music and Folklore"... but over the years, music of all nations has been studied and enjoyed. Manuals and other materials are supplied for the use of teachers.

This is the twenty-first year of Standard School Broadcasts. It is our sincere hope that we have helped children in the West know and appreciate the music of the world and understand better its people.

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OF CALIFORNIA
plans ahead to serve you better

Standard Oil Company of California

McKee Engineering Service

to the Petroleum Processing Industry is

World Wide

McKEE is currently engaged in engineering projects for the Petroleum and Iron and Steel industries in the United States and *twelve foreign countries.**

The broad facilities and ample resources of the McKee organization enable us to undertake all phases of plant design, engineering, material procurement and construction of refinery projects of any size in any domestic or foreign location.

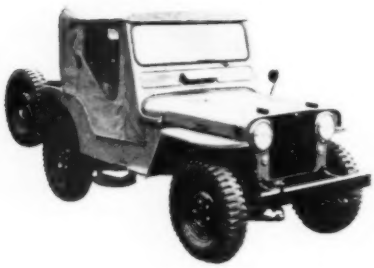
*Argentina	Egypt	India
Brazil	England	Italy
Canada	France	Mexico
China	Holland	Venezuela

ARTHUR G. McKEE & COMPANY

DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

ENGINEERS AND CONTRACTORS • ESTABLISHED 1905
2300 CHESTER AVENUE, CLEVELAND
30 Rockefeller Plaza, New York, N. Y.

The 'Jeep' Gets There Ahead of the Roads!



Tops for the Universal 'Jeep' are available in both full and half-cab sizes. Fabric tops are practical and inexpensive, providing ample protection in most weather. For snug, year-'round, all-weather protection metal tops are also obtainable.

Fabric or metal tops optional at extra cost.

The one all-purpose vehicle that you can always depend on to get through the roughest oil country—even where no roads exist—is the Universal 'Jeep'. Rugged four-wheel-drive traction gives this maneuverable, low-weight "toughie" the get-there ability you need to reach any part of a field in all kinds of weather. In conventional two-wheel-drive it moves along fast on the hard roads.

Throughout the oil industry, from exploration to lease maintenance, the Universal 'Jeep' is efficiently speeding up work and doing more jobs at less cost. Let a Willys-Overland dealer show what it can do for you.

4-WHEEL-DRIVE UNIVERSAL 'Jeep'

WILLYS-OVERLAND MOTORS, TOLEDO 1, OHIO • MAKERS OF AMERICA'S MOST USEFUL VEHICLES

HERE'S WHAT REPUBLIC DISTRIBUTORS SAY . . .

★ We Lower Your Costs . . .
Considering Service, Inventory Savings, and Emergency Co-operation

★ Mr. Ashley De Witt
Vice Pres. and Gen. Mgr.
Briggs-Weaver
Machinery Company
309 N. Market Street
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In Youngstown, Ohio, and throughout the nation, people have confidence in the rubber products made by Republic men.

CHALLENGER TRANSMISSION BELTING

Top Performance on Toughest Service

Challenger Belting is recommended for all around transmission of power. It has maximum strength for severe stresses and shocks. Hard duck impregnated with live rubber friction gives minimum stretch and freedom from fastener troubles. Challenger has maximum flexing life for drives operating at high speeds over small diameter pulleys.

BUYMANSHIP and SALESMANSHIP

Let's look at your purchasing this way

Though you want the right price, isn't it product performance, availability, and delivery service that are of primary importance? It is good "buymanship" to consider all these factors when you are purchasing transmission belting, conveyor belting, and hose.

Republic Rubber Distributors, located throughout the nation are competitive in price on transmission belting, conveyor belting, and hose of all kinds. They are prepared to offer recommendations on product applications, they carry large inventories which are available at your beck and call . . . and personal attention to your purchasing requirements is their stock-in-trade. This is good "salesmanship." Only distributors give so much service.

Let's combine your good "buymanship" with Republic "salesmanship" for better product selection. Mail the coupon or write and we will give you the Republic distributor's name in your vicinity.

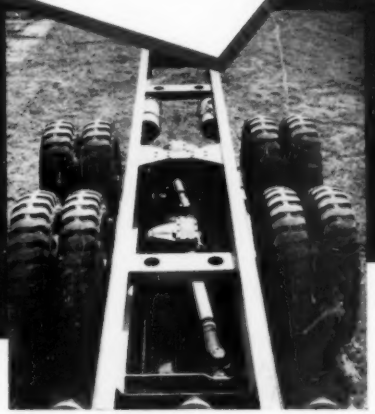
REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION · YOUNGSTOWN, OHIO
Lee Deluxe Tires & Tubes · Conshohocken, Pa.

MECHANICAL RUBBER GOODS BY
REPUBLIC RUBBER DIVISION

WHO REPRESENTS REPUBLIC IN MY AREA?
REPUBLIC RUBBER DIVISION · LEE RUBBER & TIRE CORP.
YOUNGSTOWN, OHIO

Name, title_____
Firm_____
Address_____
City_____ State_____

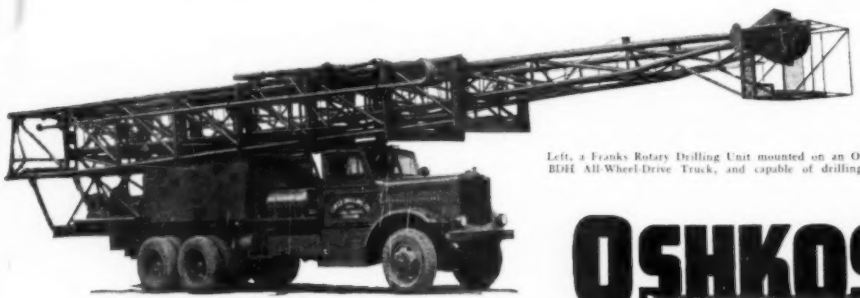
BIG ENOUGH *and* STRONG ENOUGH



Oshkosh Trucks are built for the *big* jobs—the *tough* jobs, on the road or in the oil fields. They are built to haul the heaviest oil industry equipment as well as to operate mounted auxiliary equipment. All-Wheel-Drive makes it possible to operate on practically any terrain. Manufacturers of portable oil field equipment praise Oshkosh Trucks. They have found it unnecessary to add frame reinforcement to handle even the heaviest drilling and servicing equipment. The Oshkosh Truck is designed and engineered to take all auxiliary equipment with a minimum of change. If you are faced with the problem of transportation and operation of such equipment, specify Oshkosh Trucks.

OSHKOSH FEATURES:

- **All-Wheel Drive**
- **Hydraulic Power Steer**
- **Maximum Maneuverability**
- **Rugged Transmissions**
- **Sturdy Frames and Axles**
- **Powerful Engines**
- **Hydraulic Coupling**
- **Heavy Duty, Over size Industrial Type Radiator**
- **Air Actuated Brakes**



Left, a Franks Rotary Drilling Unit mounted on an Oshkosh Model W-1600-BDH All-Wheel-Drive Truck, and capable of drilling 4,000 to 8,000 feet.

Write for Literature

OSHKOSH MOTOR TRUCK, INC.
OSHKOSH, WISCONSIN

Mid-Continent Representative
GARDNER-PRICE COMPANY
728 Wright Building
Tulsa 3, Okla.

Chapman List 960

. . . the forged steel gate valve that's

Built to Take it

Chapman was thinking of *your needs* when it designed this sturdy gate valve. That's why there are so many features that mean lower maintenance costs . . . longer years of useful life.

Take for instance the materials. There's tough forged steel in body and yoke . . . stainless steel in seat rings and plugs. Discs are not just hardened . . . they are superhardened by Malcomizing.

But that's only part of it. This valve is designed so you can repack it under full pressure . . . so that yoke threads are protected against rust and corrosion. And designed without gaskets to blow.

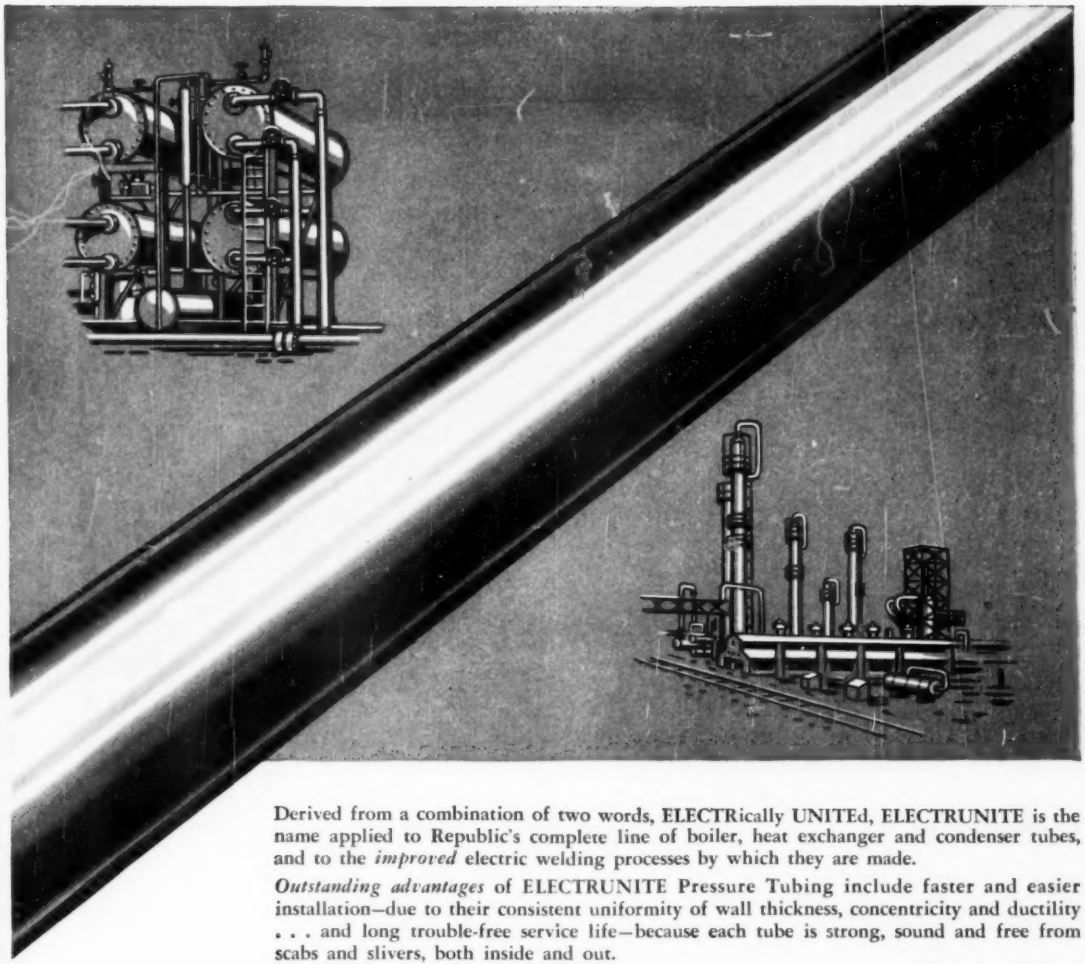
It's available in sizes from ¼" to 2" . . . carbon steel for pressures to 800 pounds; alloy steel for pressures to 1000 pounds at 750° F. For higher pressures, specify List 990.

The CHAPMAN Valve Mfg. Co.
INDIAN ORCHARD, MASS.

ELECTRUNITE

means

ELECTRICALLY UNITED



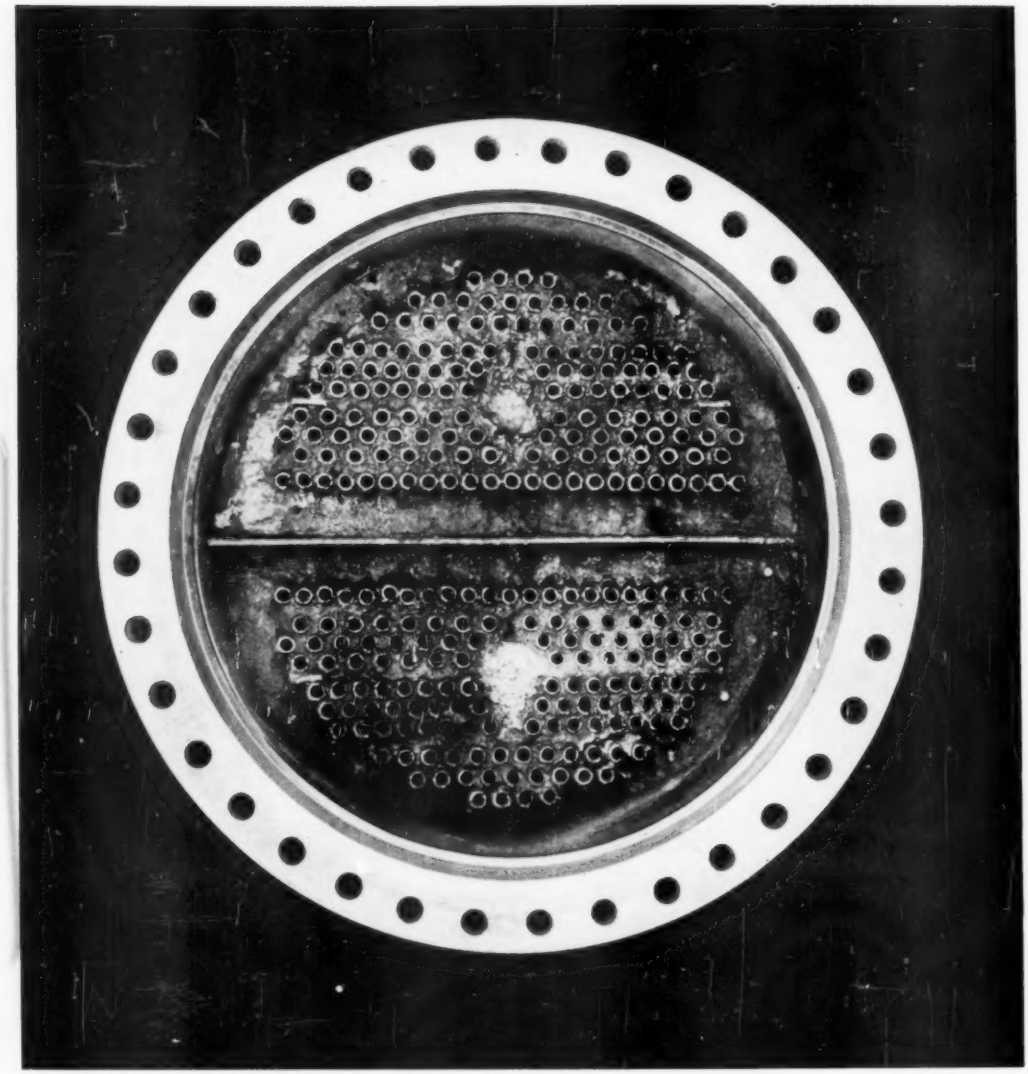
Derived from a combination of two words, ELECTRically UNITEd, ELECTRUNITE is the name applied to Republic's complete line of boiler, heat exchanger and condenser tubes, and to the *improved* electric welding processes by which they are made.

Outstanding advantages of ELECTRUNITE Pressure Tubing include faster and easier installation—due to their consistent uniformity of wall thickness, concentricity and ductility . . . and long trouble-free service life—because each tube is strong, sound and free from scabs and slivers, both inside and out.

ELECTRUNITE Pressure Tubing is available in a wide range of sizes, gages and analyses in both carbon and stainless steels. During the past 17 years, more than 200,000,000 feet of this *modern* tubing has been installed in countless types of steam generating and heat transfer equipment used throughout all industry. For complete information about the ELECTRUNITE Process and ELECTRUNITE Pressure Tubes, both carbon and stainless, write for a FREE copy of Booklet BT-12.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, New York

Republic
REPUBLIC STEEL
ELECTRUNITE



WHICH TUBES NEED REPLACING?

Improved electronic device spots bad condenser or heat exchanger tubes **BEFORE THEY FAIL!**

● Put the maintenance of your tubular equipment on a scheduled basis with the improved PROBOLOG.

Save Time and Trouble by regular check-ups that will be ahead of sudden tube failures that cause emergency shutdowns. No more good tubes removed through error...no more bad tubes left in place.

Spot Defects in non-magnetic metallic tubes such as: eroded and corroded pits, cracks; strained and dezincification areas; abnormal changes in physical dimensions.

• • •

See a demonstration of this compact, lightweight equipment to appreciate its cost-saving possibilities. For more particular information about the PROBOLOG, communicate with the Shell Development Company, Incorporated, 50 West 50th Street, New York 20, New York.

SHELL

SHELL DEVELOPMENT COMPANY
INCORPORATED

ALONG THE PIPELINES . . . IN THE OIL FIELDS . . . OVER-THE-HIGHWAY . . . GENERALS move heavy loads faster, safer, at lower cost

H. C. T. For heavy loads picked up off-the-road . . . carried over-the-highway . . . and delivered off-the-road. Deep, non-skid, smooth-rolling ribs of rubber on a thick, cushioned, tough undertread. Powerful lugs angled around husky shoulders for extra non-skid traction. Easy-going over off-the-road mud, slush, sand and gravel. Heavy, reinforced sidewalls protect the sturdy carcass against bruises and cuts. More, safer, lower-cost miles of service on and off-the-highway. More recaps. More profit every mile—every job.

L. C. M. Designed for power, massive lugs of thick rubber set at a 30° angle from the center of the tread dig in and convert horsepower into maximum pulling power where it's needed most . . . off-the-road. The self-cleaning tread provides full traction efficiency in mud, slush, rocks, sand and gravel. Tremendous, wide shoulders prevent injuries to sidewalls. Off or on-the-road the L. C. M. gives you more miles of low-cost, dependable service under toughest trucking conditions.

The GENERAL TRUCK TIRE

THE GENERAL TIRE & RUBBER CO., AKRON, OHIO

BUCYRUS-ERIE SPUDDERS

are hitting 'pay' across the U. S. A.

BUCYRUS ERIE

24-L AVAILABLE FOR PROMPT DELIVERY

24-L in Pennsylvania

One of the models responsible for the excellent showing of Bucyrus-Erie spudders on secondary recovery work in the Eastern oil fields is the mobile 24-L. Capable of handling servicing to depths as great as 2000 feet, the 24-L, like the one pictured here near Bradford, Pa., also speedily drills top-to-bottom wells to 1500 feet. Operators everywhere have been pleased by its unexcelled spudding motion, response to controls, and all-round economical performance — the same features that have made the larger 28-L, 36-L, and 48-L models so popular.

Bucyrus-Erie Company, South Milwaukee, Wisconsin. Drill Sales Division offices in Dallas, Texas; Englewood, New Jersey, and Evansville, Indiana.

43949

See Your Bucyrus-Erie Spudder Distributor

Beacon Supply Co. - Borger and Pampa, Texas
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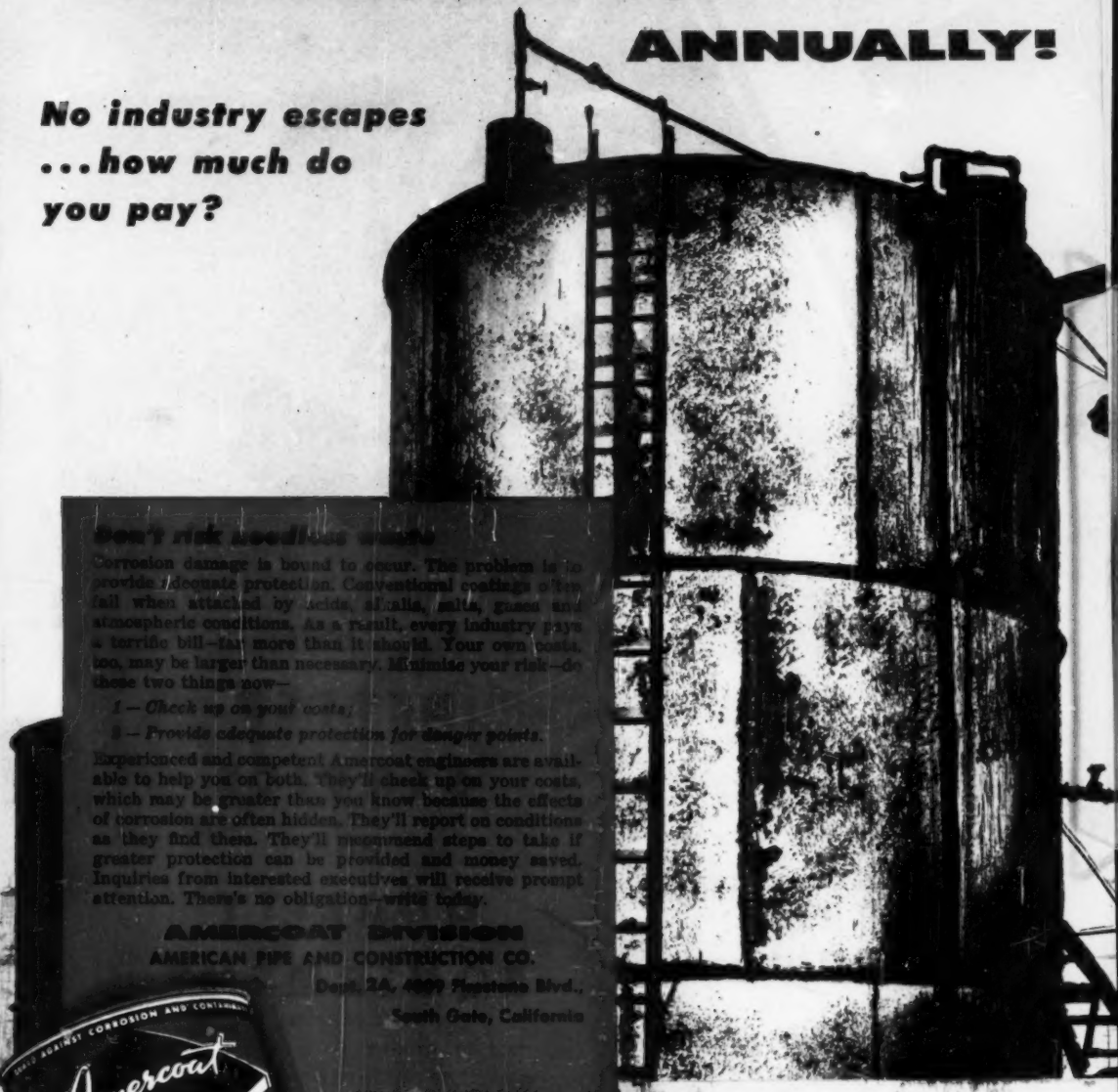
Drillers Supply Co. - - - Joplin, Mo.
Drilling & Mining Equipment Co. - - - - - - - - Los Angeles 21, Calif.
Great Northern Tool & Supply Co. - Billings, Kevin and Cut Bank, Mont.; Casper, Wyo.
Gross Supply Co. - - - El Dorado, Kan.
Hauco Supply Co. - - Greensburg, Pa.
Iverson Supply Co. - - - Tulsa, Okla., Odessa, Texas; Artesia, N. M.
The McJunkin Supply Co. - Charleston, W. Va.
Olympic Supply Co. - - Seattle, Wash.
Randall-Zogg Supply Co. - Owensboro, Ky.
The Straker Supply - - Mt. Pleasant, Mich.
Tillsonburg Pipe & Supply Co. - Tillsonburg, Ont.
Turner Valley Supply Co., Ltd. - Calgary, Alta.
Zanesville Tool & Supply Co. - - - - - - Zanesville and Wooster, Ohio

CORROSION COSTS

$6,000,000,000.00

ANNUALLY!

No industry escapes ...how much do you pay?



Don't risk needless waste

Corrosion damage is bound to occur. The problem is to provide adequate protection. Conventional coatings often fail when attacked by acids, alkalis, salts, gases and atmospheric conditions. As a result, every industry pays a terrific bill—far more than it should. Your own costs, too, may be larger than necessary. Minimize your risk—do these two things now—

1 — Check up on your costs;

2 — Provide adequate protection for danger points.

Experienced and competent Amercoat engineers are available to help you on both. They'll check up on your costs, which may be greater than you know because the effects of corrosion are often hidden. They'll report on conditions as they find them. They'll recommend steps to take if greater protection can be provided and money saved. Inquiries from interested executives will receive prompt attention. There's no obligation—write today.

AMERCOAT DIVISION
AMERICAN PIPE AND CONSTRUCTION CO.
Dept. 2A, 4809 Firestone Blvd.,
South Gate, California

FOLLOW THE LINE OF *most* RESISTANCE

A SYSTEM OF SURFACE PROTECTION

"Serving The Oil and Gas Industries"

THE SYMBOL

FOR

BETTER SERVICE AND QUALITY EQUIPMENT

Pipe Pumps
Engines Motors
Valves Flanges
Controls Studs
Gaskets Fittings
Hardware
Fabricated Piping

CONTINENTAL

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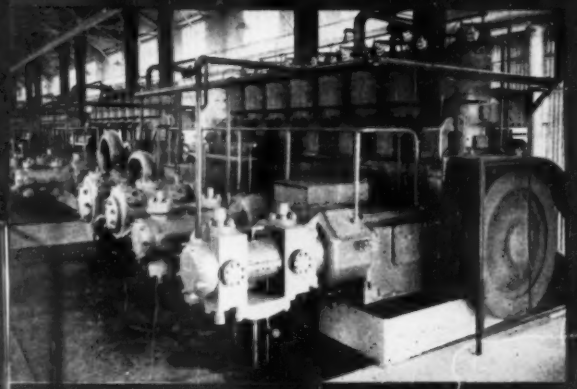
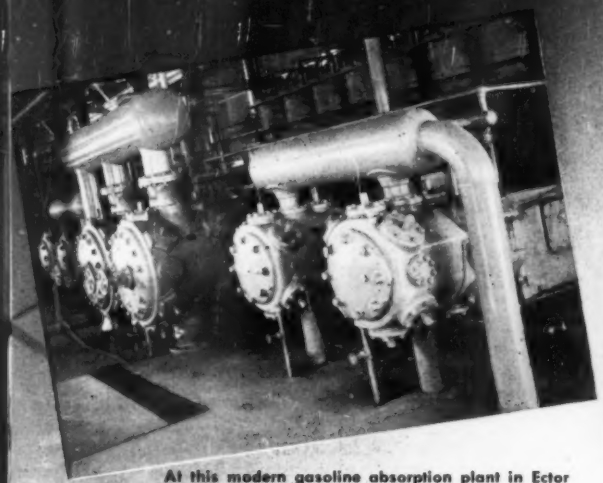
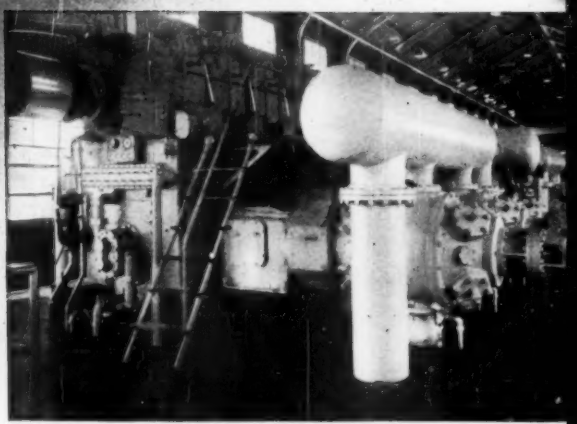
Conservation IS KEYNOTE



In this modern gasoline absorption plant in Yoakum County, Texas, Clark Right Angle Compressors take gas from the field at pressures between atmosphere and 7 psig and compress it in two stages to 205 psig for processing.



At this modern gasoline absorption plant in Ector County, Texas, gas is taken in from the field at pressures between atmosphere and 7 psig and compressed in two stages to a final discharge pressure of 205 psig. Compressor installation shown here consists of eleven Clark 800-BHP Right Angles.



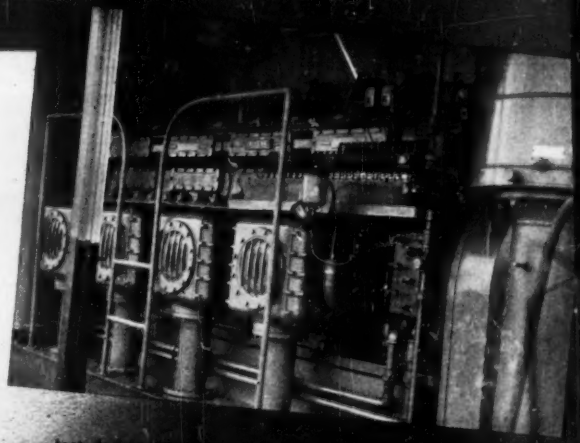
Several producing companies co-operated on this joint conservation project in Texas. This fine, modern plant is equipped with Clark 8-cyl., 1600-BHP "Big Angles", shown above. Flare gas is compressed in three stages up to 1000 psi and discharged into a pipe line for transmission.

CLARK { **SETS THE PACE IN COMPRESSOR PROGRESS**

OF OIL AND GAS INDUSTRY

Probably the most important development in the petroleum industry in recent years is the spectacular progress made in conservation measures. Modern repressuring, recycling and gasoline absorption plants save untold quantities of gas and oil, both for current use and for the future, that would otherwise be wasted.

Clark Compressors are playing a major role in this great enterprise. In 1948, over 100,000 BHP of Clark units were installed in Texas alone, for use in conservation projects . . . Big Angles, Midget Angles and Right Angles.



In this plant near Beaumont, Texas, natural gas is gathered from the field, compressed and then put through an absorption process and natural gasoline is extracted. Residue gas is then utilized. Compressors are Clark 8-cyl., 800-BHP Right Angles.

CLARK BROS. CO., INC. • OLEAN, NEW YORK

One of the Dresser Industries

BIRMINGHAM, ALABAMA, BOSTON, CHICAGO, DETROIT, HOUSTON, LOS ANGELES, NEW YORK, SALT LAKE CITY, SAN FRANCISCO, TULSA, WASHINGTON, LONDON, PARIS, BUCHAREST, RUMANIA, CARACAS, VENEZUELA, BUENOS AIRES, ARGENTINA

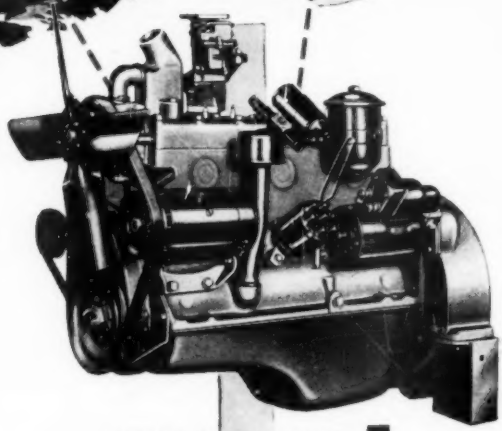
FOR A BETTER DAY'S WORK

on farms—

IN INDUSTRY—IN OIL FIELDS—IN FORESTS—AND ON THE HIGHWAYS!

● Here's steady, economical power for a better day's work, day after day, year after year. Here's power with a pedigree of performance backed by Chrysler Corporation skills and techniques. Whether it be in tractors that tend crops for the world—or in powered equipment serving a hundred varied industries—Chrysler Industrial Engines and Power Units prove their dependability *on the job!* It will pay you to get the facts on the entire Chrysler Industrial line. Just write . . .

INDUSTRIAL ENGINE DIVISION, CHRYSLER CORP.
12200 E. JEFFERSON, DETROIT 31, MICHIGAN



MODEL INDUSTRIAL 5
SIX CYLINDER

Bore 3¼". Stroke 4⅜". 217.7 cubic inches displacement. Engine assembly comes equipped with 6-volt electrical equipment, 4-speed transmission, 19" four-blade suction fan, dustproof distributor and oil bath air cleaner. Generally used in powering tractors and other mobile industrial units for economy and dependability.

CHRYSLER

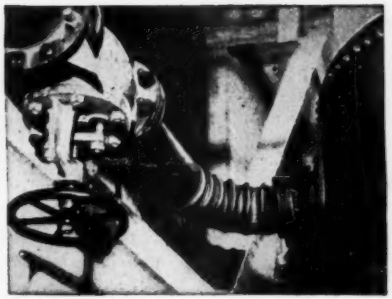
INDUSTRIAL ENGINES AND POWER UNITS

HORSEPOWER WITH A PEDIGREE

MODELS AVAILABLE WITH *gyrol* FLUID COUPLINGS

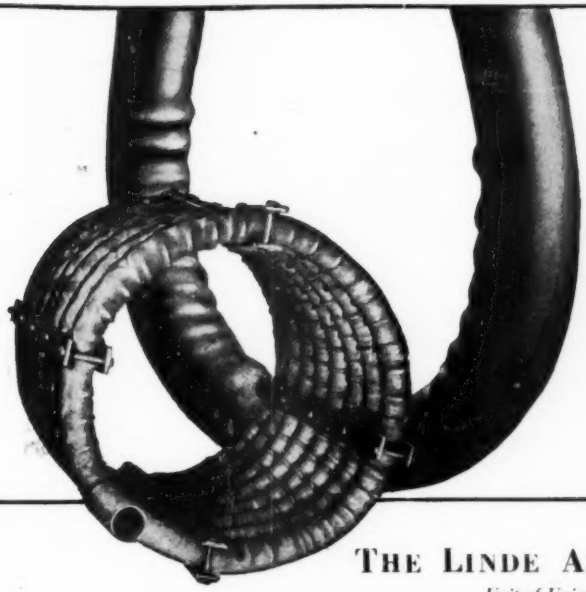
"Tailor-Made" Bends

Where compound bends are required in a continuous section of pipe, wrinkle-bends offer an ideal solution. Wrinkle-bends are leakproof, as strong as the pipe itself, require no maintenance, and are easy to insulate.



This short-radius wrinkle-bend joins a compressed air line to a reservoir. Wrinkle-bends can be made in brass, copper, aluminum, and steel pipe from 2 inches to 26 inches in diameter.

Pipe bends can be made right on the spot with the aid of an oxy-acetylene welding or heating blowpipe, a simple bending rig, and a few common tools. Wrinkle-bending does not reduce the thickness of pipe walls.



This condenser coil made from 2-inch stainless steel pipe has 350 wrinkle-bends.

There are many LINDE methods for forming, cutting, joining, and treating metals. LINDE engineering service is always on call to help customers with production, construction, and maintenance jobs. Just call the nearest LINDE office.

The word "Linde" is a registered trade-mark of The Linde Air Products Company.

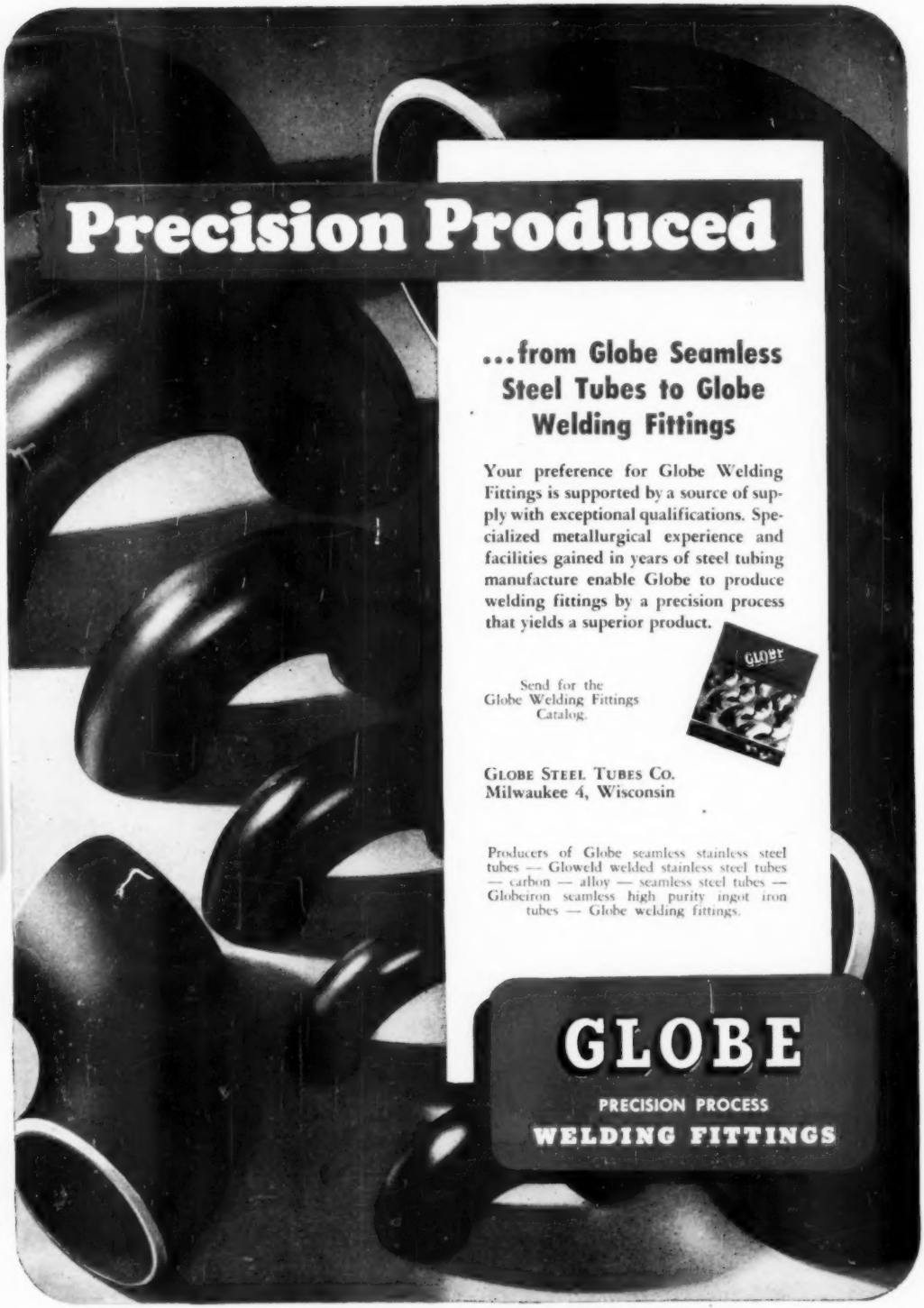
Linde

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd St., New York, 17, N.Y. UCC Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto



Precision Produced

...from Globe Seamless Steel Tubes to Globe Welding Fittings

Your preference for Globe Welding Fittings is supported by a source of supply with exceptional qualifications. Specialized metallurgical experience and facilities gained in years of steel tubing manufacture enable Globe to produce welding fittings by a precision process that yields a superior product.

Send for the Globe Welding Fittings Catalog.

GLOBE STEEL TUBES CO.
Milwaukee 4, Wisconsin

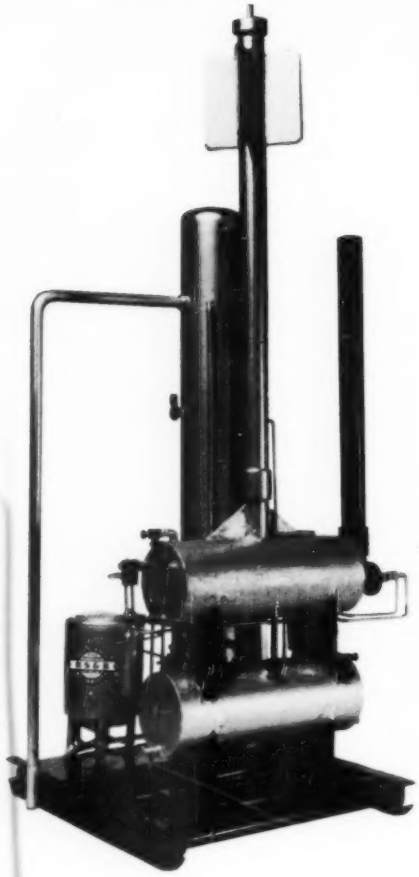
Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — carbon — alloy — seamless steel tubes — Globeiron seamless high purity ingot iron tubes — Globe welding fittings.

GLOBE
PRECISION PROCESS
WELDING FITTINGS

Low cost dehydration is here!

At last! Gas well operators can dehydrate gas
right at the well head . . . completely and inexpensively.
This long awaited benefit is here today
with BS&B's new Model 2WDH5 Glycol-type Gas Dehydrator.
The unit catches hydrate trouble at the roots.
By halting freeze-ups in the lead lines, it prevents larger
and more costly freeze-ups in the main lines. No longer will gas operators
be forced to break main line freeze-ups at high cost, with useless waste.
They will welcome BS&B's well head dehydrator
as a great contribution to the gas industry.

BLACK, SIVALLS & BRYSON, INC.



Now—BS&B brings you Low Cost Gas Dehydration at the Well Head!

It's here at last! With the Model 2WDH5, Glycol-type, Gas Dehydrator, BS&B brings you low cost gas dehydration at the well head . . . *that pays off!*

Here's how BS&B's new dehydrator can pay off for you . . .

1. The initial cost is amazingly low. This is possible because BS&B simplified design and took advantage of energy present in high pressure gas.
2. Operating costs are low. Fuel consumption is small . . . cheap power from the pump . . . few moving parts mean long life for the unit.
3. BS&B's new Model 2WDH5 keeps your gathering system clear of water. That means no freeze-ups even under peak load conditions. You save money on line repairs, labor, truck, and tool expense, solvents. No "blow downs" mean less gas wasted.
4. In the summer it keeps your lines free of corrosion, ready for peak deliveries later.
5. When the BS&B Model 2WDH5 Gas Dehydrator replaces standard lease equipment, it covers its own cost *with actual savings.*
6. Often the value of natural gasoline recovered saves you enough to *largely cover the cost* of installation and operation.

BS&B's Model 2WDH5 Gas Dehydrator will lower the dew point of gas from 35 to 45 degrees F. It can handle 2,000,000 standard cubic feet of gas per day at 500 p.s.i. working pressure.

The unit consists of a sorber and a regeneration unit. Diethylene Glycol is used as a desiccant (drying compound) in the sorber. Gas from the well head passes through your pipe line drip, oil and gas separator or inlet scrubber* where it loses its free water and natural gasoline. The gas then goes through the sorber where the desiccant removes water vapor.

The regeneration unit has a desiccant reservoir, a desiccant pump, reboiler, and still. It operates in a continuous cycle.

The entire unit is completely automatic; only routine checks every few days are necessary. It comes to you completely skid-mounted for easy transportation and installation. You may install it on your own foundation.

If the solution of your problem requires lower dew point depressions than 35 to 45 degrees F., BS&B can furnish such units for some additional cost.

Other standard units with capacities up to 20,000,000 standard cubic feet per day and working pressures up to 800 p.s.i. are available. Inquiries on special units to meet your special requirements are invited.

*If you have a pipe line drip or oil and gas separator at the well head, you do not need an inlet scrubber. But if you have neither, BS&B can furnish you a small inlet scrubber as an extra price item.

Price with skids

$1,156.00

f.o.b. Kansas City, Mo.

Price without skids
$1,032.00
f.o.b. K. C., Mo.

Weight: without skids, 1,450 pounds; with skids, 1,800 pounds. (Prices do not include inlet scrubber or glycol necessary to charge the unit. About 30 gallons of glycol at about $1.90 per gallon are necessary.)

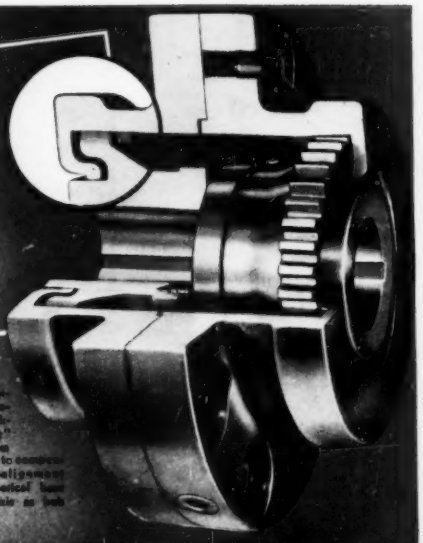
BS&B's model 2WDH5 Gas Dehydrator can pay off for you!
Contact your nearest BS&B Sales Engineer TODAY. Or write to:

BLACK, SIVALLS & BRYSON, INC.

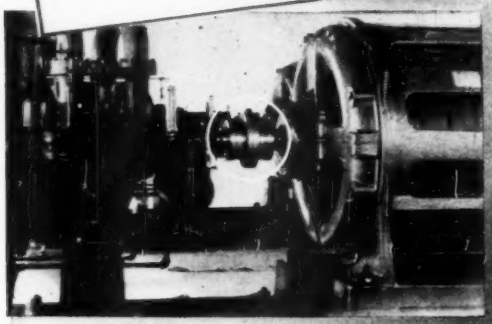
OIL FIELD EQUIPMENT DIVISION

Power & Light Bldg. Kansas City 6, Missouri

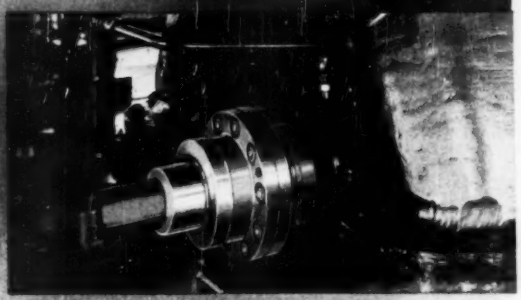
How Fast's Exclusive Metal to Metal Seal Boosts Your Plant's Production



Correctly engineered oil-protecting "rocking bearing" allows freedom of movement to compensate for misalignment because spherical bore has same axis as hub spline bore!



OIL REFINERIES insist on Fast's Couplings to *keep* their vital machinery *running*, because they know Fast's virtually *eliminate* all shutdowns due to coupling failure! This Coupling has been in service since 1931.



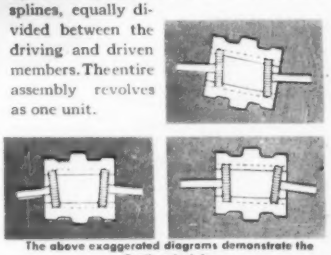
HEAVY INDUSTRIES specify Fast's Couplings because they compensate for shaft misalignment and have *no perishable parts* of any kind to fail!

YOUR production figures *go up* and *stay up* when your vital equipment is protected with Fast's Couplings, because Fast's virtually eliminate all shutdowns due to coupling failure. Fast's use no perishable parts or packing rings . . . they are the *original* gear-type coupling that *really* guards load-carrying oil from moisture, abrasive dust and grit! Fast's have *exclusive* "rocking bearing" principle that gives *sure* metal-to-metal seal.

When you specify Fast's you get years of top engineering experience, Koppers' high standard of workmanship, and unexcelled coupling service including available parts if required by change of drive, *even if your Fast's have been running for 30 years*. You save money, eliminate bottlenecks with Fast's on the job, because machine and motor life is prolonged, upkeep costs are cut, shutdown losses reduced. Find out about Fast's! Use the handy coupon, or write today for free catalog. Address: Koppers Co., Inc., Fast's Coupling Dept., 225 Scott Street, Baltimore 3, Maryland.

FAST'S COUPLINGS COMPENSATE FOR ALL MISALIGNMENT

The floating sleeve takes a neutral position. All forms of misalignment are compensated for between the lubricated faces of the splines, equally divided between the driving and driven members. The entire assembly revolves as one unit.



The above exaggerated diagrams demonstrate the Fast's principle.

KOPPERS

FAST'S *Self Aligning* **COUPLINGS**

MAIL COUPON FOR FREE CATALOG!

KOPPERS CO., INC., FAST'S COUPLING DEPT.,
225 Scott Street, Baltimore 3, Md.

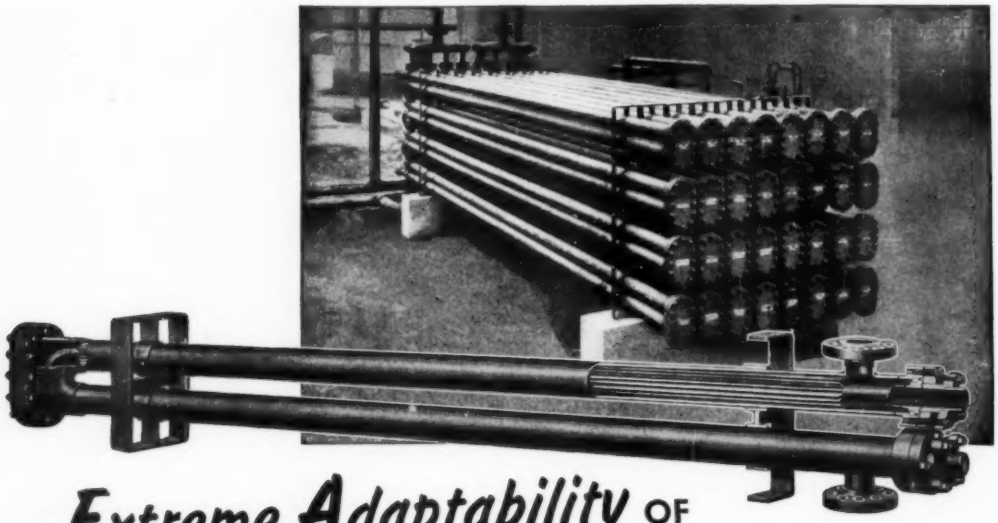
Please send me your new Fast's Coupling catalog which contains all the facts and specifications.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....



THE *Extreme Adaptability* OF

BROWN FINTUBE SECTIONAL HAIRPIN HEAT EXCHANGERS

Enables users to keep production abreast of changing market and seasonal conditions

● Unlike "bundle" type exchangers, which are custom built for a definite and fixed duty, Brown Fintube Sectional Hairpin Heat Exchangers give operating men almost unlimited flexibility to meet changing requirements. The capacity of the bank can be increased by adding additional sections to the original installation. Capacity can be decreased by valving off one or more of the parallel streams,—or reducing the number of sections in each stream. The entire bank can be changed from one duty, to another and totally different duty, by remanifolding the sections in different series-parallel arrangement. And the bank can even be disassembled, and the sections then reassembled as two or more smaller exchangers on different duties, in different plants.

Let us help you in adapting Brown Fintube Sectional Hairpin Heat Exchangers—with their many outstanding operating and maintenance advantages—to your next heat transfer requirement. The Brown Fintube Co., Elyria, Ohio. Sales engineers in the principal cities.

8 ADVANTAGES

BROWN FINTUBE
Sectional Hairpin
HEAT EXCHANGERS

1. Flanged Shell Seal and Flanged Union Head End Assembly.
2. Extreme Adaptability to Meet the Requirements of Changed Duties.
3. No Obsolescence.
4. Easy Inspection and Maintenance
5. Continuous Operation. No Shut Downs for Servicing.
6. Minimum Investment in Replacement Parts.
7. The Brown Resistance Welded Integrally Bonded Fintube.
8. Easily Removed Rear End Cover Plate.

Write today for Bulletin No. 481. It gives full details

BROWN FINTUBE
Sectional Hairpin
HEAT EXCHANGERS

RESISTANCE WELDED INTEGRALLY BONDED FINTUBES AND FINTUBE HEAT TRANSFER PRODUCTS

Brute Strength *and a "Delicate Touch"*

An OLIVER "Cletrac" **Plus Advantage**

Oliver "Cletrac" Model FDE equipped with shear dozer and tree pusher mounted on Drott Trailbuilder clearing right-of-way.

Clearing a right-of-way for power lines is a job that requires an ideal combination of brute strength and perfect control. The answer . . . Oliver "Cletrac"!

This model FDE equipped with a shear dozer and tree pusher mounted on a Drott Trailbuilder is the ideal unit for land clearing and grubbing. It removes only the minimum amount of top soil . . . yet it effectively clears the right-of-way.

The husky Oliver "Cletrac" Model FDE provides plenty of rugged power for the toughest terrain. And the new Oliver "Cletrac" air steering and braking system provides the perfect control so necessary for fast, efficient operation, *on level ground or steep slopes.* Add to this, the fact that there is always power on both tracks . . . *even on turns* . . . and it's easy to see why the Oliver "Cletrac" combination of brute strength plus the light touch on the controls is the ideal unit for any job.

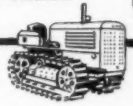
For all the facts, see your Oliver Industrial Distributor or write to The Oliver Corporation, Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio.

Cletrac

a product of

The OLIVER Corporation

A complete line of Crawler and Industrial Wheel Tractors



"THE SIGN OF EXTRA SERVICE"

TRANS

...with

Taylor's new force-balance temperature transmitter is faster, needs little maintenance, has a tiny bulb and short, shiftable range spans

HERE is a new kind of instrument that pneumatically transmits temperature as far as 1000 feet—with an extremely high degree of accuracy! Thermal element gives 63% response in less than 2 seconds (agitated water).

In addition, Speed-Act, — an entirely new technique in temperature measurement — may be added to compensate for unusual thermal lags such as occur in applications requiring separable wells.

COMPARE TRANSAIRE'S* 9 OUTSTANDING FEATURES:

1. Faster — Unprecedented speed of response.

2. Tiny, "cigarette size" bulb is more adaptable to confined space, contributes to fast speed of response. $\frac{3}{8}$" by 3" or $\frac{1}{2}$" by $3\frac{7}{16}$".

3. Short, shiftable range spans:

(a) Standard range span of 50° available where you need exceptionally close readings. Other operating range spans: 100°, 200 and 400°F.; or 25°, 50°, 100° and 200°C. Overall temperature limits from minus 375° to plus 1000°F. or minus 200°C to plus 500°C.

(b) You can shift 50° span with screwdriver from 0 to 50° to 50° to 100°, or 100° to 150°, or any intermediate 50°F. interval. Other spans similarly adjusted.

(c) Range limits interchangeable by substitution of new spring assembly, giving much greater flexibility.

4. Little or no maintenance needed. Force-balance principle practically eliminates wear. Instrument may be quickly adapted to different operating conditions by interchangeable thermal system, spring assemblies and manifold. Permits low inventory of components.

5. Eliminates all electrical hazards in explosive atmospheres.

6. Positive-acting Pilot Valve — Taylor FULSCOPE Relay Air Valve assures quick changes in transmission pressure, overcomes effect of minor leaks.

7. Fixed and Linear Output Range — 3 to 15 psi output for full temperature span is linear to 0.012 psi. Fixed output pressure span *eliminates need for individual calibration of receivers or receiver-controllers.*

8. Fully Compensated for barometric and ambient temperature changes.

9. Great Overrange Protection — withstands temperatures of 1000°F. regardless of range.

TRANSAIRE* with SPEED-ACT is one more step in Taylor's coordinated program for developing better industrial instrumentation. It grew from intensive research and design effort which had just one purpose: to produce a temperature transmitter *unsurpassed in accuracy and durability.*

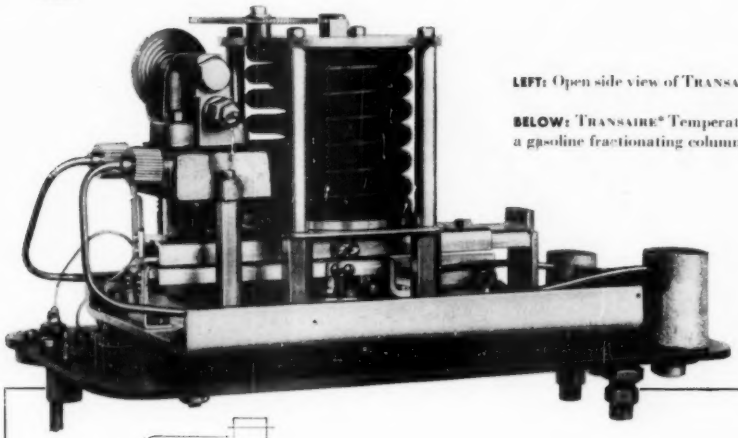
Ask your Taylor Field Engineer! Or write for **Bulletin 98140.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

• • •

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

AIRE*!

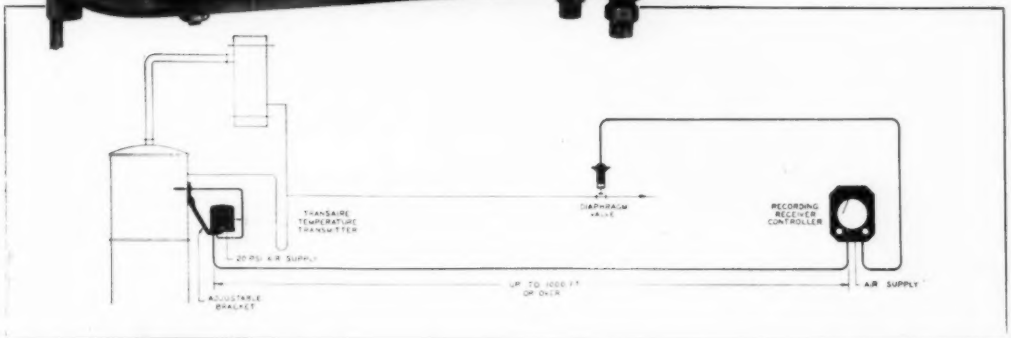
Speed-Act!



LEFT: Open side view of TRANSAIRE* Temperature Transmitter.

BELOW: TRANSAIRE* Temperature Transmitter in operation on a gasoline fractionating column.

* Trade-Mark



QUICK PICTURE OF FORCE BALANCE

TRANSAIRE* consists of *four* main assemblies:

1. A unique gas thermal system which provides force necessary to actuate transmitter.

2. A simple lever which transmits the force of the thermal system to operate the baffle—no pivots used!

3. A spring and compensating bellows assembly which balances the initial pressure in thermal system and compensates for barometric and temperature changes.

4. A balancing pneumatic circuit consisting of a bellows, baffle, nozzle and relay valve. These convert force developed by lever to precisely proportion output air pressure according to measured temperature.

Taylor Instruments

MEAN

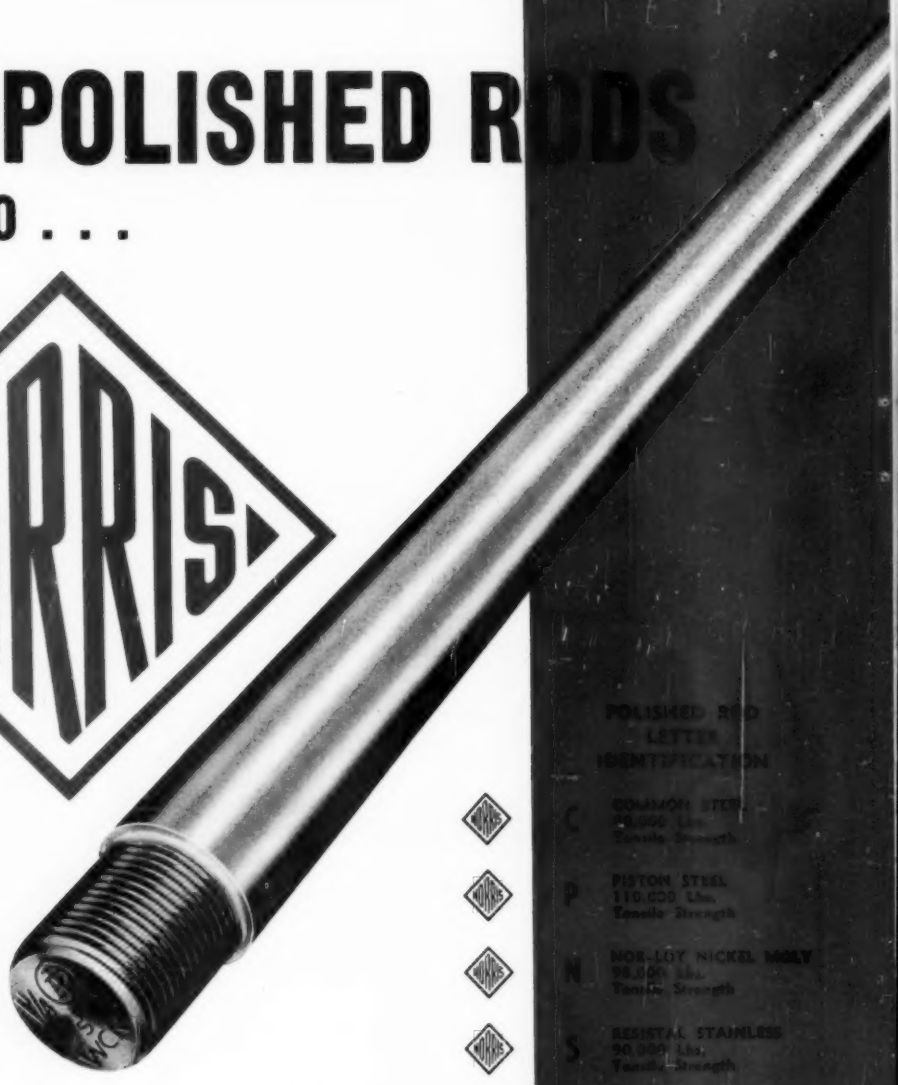
ACCURACY FIRST

IN HOME AND INDUSTRY

FOR POLISHED RODS

LOOK TO . . .

NORRIS



NORRIS offers a diversified line of NOR-TEX Polished Rods for service under all pumping conditions. Rods are available in all API lengths and pin sizes.

Each W. C. Norris Polished Rod is identified by a stamping on the end, indicating rod and pin sizes and letter identification of type of metal. To insure safe delivery, each Polished Rod is individually protected in a special shipping container. Pins are equipped with metal thread protectors.

For complete information write for Bulletin No. 28-B.

W.C. NORRIS, MANUFACTURER, INC.

TULSA, OKLAHOMA

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SALEM, ILLINOIS; CASPER, WYOMING

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JOURNALLY Speaking

Wasted Energy

APPROXIMATELY one billion B.t.u.'s of energy are consumed in this country every second, day and night, but less than one-third are used productively, according to William M. Holaday, research director of Socony-Vacuum Oil Co., Inc.

He was plugging for more efficient engines and burners, but we could help him out with quite a list of other nonproductive uses of energy. Top of the list would be the kilowatts used in broadcasting some of the political speeches we have tuned out lately.

What Price Gas

RED-HEADED Brig. Gen. E. O. (Ernie) Thompson, most vocal of the Texas Railroad Commissioners, has been in New York telling eastern consumers that the value of natural gas, compared with the price of crude oil, is 44 cents a thousand cubic feet, which is 5 or 10 times its current price in Texas. Chances are, however, that the Federal Power Commission will consider this just another one of those exaggerations for which Texans have such a reputation and will continue to try to fix the value of natural gas in the same way the value of a railroad right-of-way is determined.

Scoop

THE long-expected has finally happened. The Russians have discovered that they discovered oil.

With becoming modesty, Radio Moscow has let the world in on the secret—a Russian "industrialist" named Sidorov invented the oil well in 1855, 4 years before Colonel Drake conceived the idea of making whale oil unpopular.

Moscow didn't say what happened to the oil well once it was discovered, but presumably, like so many other things the Russians "discovered" so many years before there was any need for them, Sidorov's well was carefully folded up and tucked away somewhere. At any rate, nobody seems to have given any thought to linking the newly invented oil to the submarine which a Russian peasant had invented some 30 years before.

What's more to the point, hinted the red radio, Colonel Drake and his successors were outright pirates with no regard for the Russian patent laws, if any, and knew when they dug a hole in the ground that the idea of the hole in the ground belonged to a Russian "industrialist."

"The Americans prefer not to recall this fact and try to claim for themselves the glory due to the Russian inventor Sidorov," Moscow Radio was quoted in a dispatch from London.

Confidential reports from behind the iron curtain states that the next Russian invention will be bubble gum.

The Typo Error

LIKE all other publications we try our durndest to catch all typographical errors. But, like all other publications, some get by in spite of our checks and double checks.

What beats us is how these typos stick out like sore thumbs after the magazine is off the press even though they were missed by half a dozen experienced people whose business it is to hunt for them before they get that far.

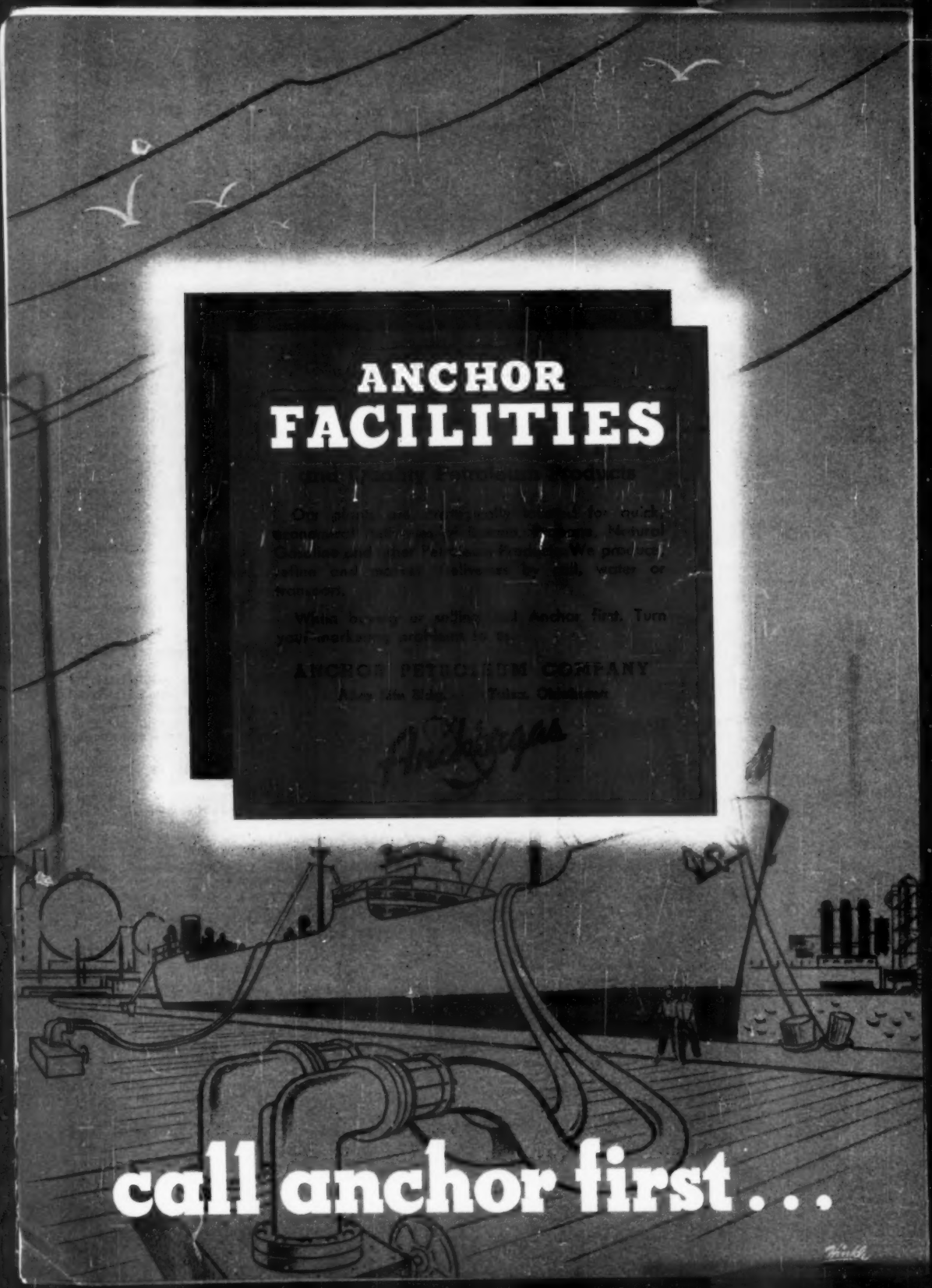
That we are not alone in this experience is shown by the following bit of verse which somebody spotted in a printers' magazine:

The typographical error is
A slippery thing and sly;
You can hunt it 'til you're dizzy,
But it somehow will get by.

'Til the forms are off the presses
It is strange how still it keeps.
It shrinks down in a corner
And it never stirs or peeps.

That typographical error,
Too small for human eyes,
'Til the ink is on the paper,
When it grows to mountain size.

The remainder of the issue
May be clean as clean can be,
But the typographical error
Is the only thing you see!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the OIL AND GAS JOURNAL

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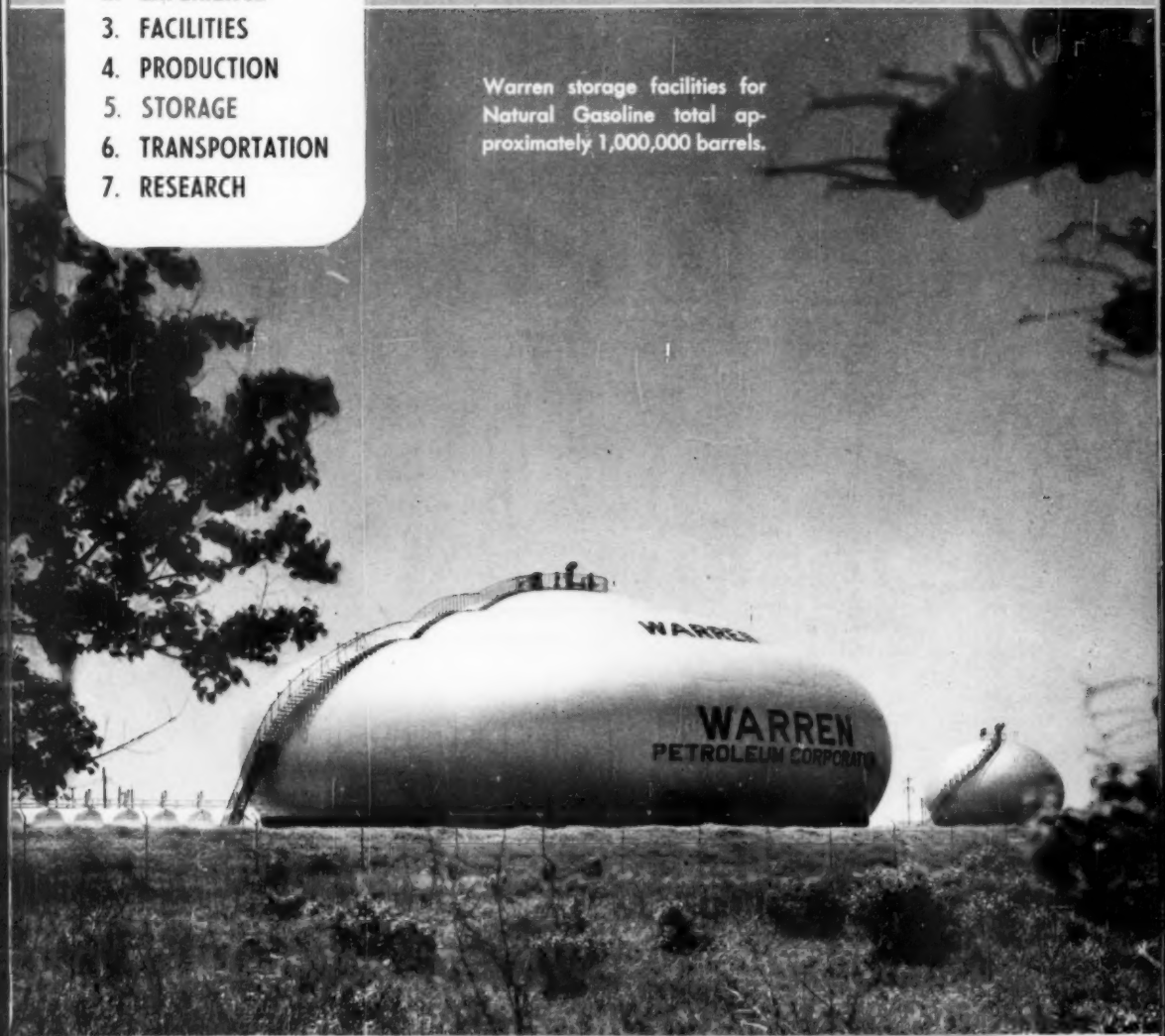
Warren storage facilities for Natural Gasoline total approximately 1,000,000 barrels.



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THE OIL AND GAS JOURNAL

On the Move

AS we looked over the travel schedule of the Journal's editorial staff for the week, we were again impressed with the increasing importance of meetings in all divisions of the oil industry's activities.

The week opened on Sunday with R. B. Tuttle present at the dedication of the Bureau of Mines coal-to-oil synthetic plant at Louisiana, Mo. From Jacksonville, Fla., on Monday and Tuesday, Henry Ralph was reporting by telegraph the proceedings of the Interstate Oil Compact Commission. On the same dates Paul Reed in like manner was covering the spring meeting of the natural-gas department of the American Gas Association at French Lick, Ind. Out in California Bob Harwick is preparing a first-hand report on the A.P.I.'s 2-day Pacific Coast production sessions. In Tulsa, Ken Barnes and other members of the home staff devoted full time, Monday through Wednesday, to the significant sessions of the American Institute of Chemical Engineers. Reports on the A.P.I. marketing session at St. Louis were also obtained. On Saturday Dave Stormont will attend the Slaughter gasoline plant opening at Sundown in West Texas.

Our curiosity aroused by this perusal of the week's activities, we made a quick count and found out that one or more members of the Journal's staff had attended 20 major meetings of associations and technical societies this year and about the same number of regional and district sessions.

All told we have devoted approximately 150,000 words to the coverage of these meetings. With illustrations, this means we have already given our readers so far in 1949 the equivalent of a sizable book on what happened at the numerous assemblies of oil men. Staff men travel many additional thousands of miles in reporting hearings, demonstrations, ceremonies, and the like which appear weekly on the oil man's calendar.

Within the oil industry those who authorize attendance and approve expense accounts sometimes wonder as to the need of these meetings. The foregoing reflects our viewpoint as to their value.

There is an increasing number of ramifications in the business of oil—some so large that each merits being considered an industrial enterprise by itself. The specialized meeting is one way of pooling the technical and operating accomplishments of the laboratories, fields, pipe lines, and plants, with all who participate benefiting. The coordination of these activities to assure the steady growth of an integrated industry comes within the province of the national assemblies motivated by the principles of free and competitive enterprise and the democratic way of doing things.

So our traveling editors will continue to welcome these opportunities to present concise but comprehensive reports on the doings of oil men wherever they gather. Collectively they represent a clearing house and guide in exploration, drilling, production, refining, and transportation. Next week and throughout the year staff members will continue on the move.

Compact Drops Supply-Demand Forecast in 1949 Meeting

by Henry D. Ralph

JACKSONVILLE.—In a definite move away from close association with current problems of the oil industry, the Interstate Oil Compact Commission has abandoned its forecasts of supply and demand which have been one of the chief features of its meetings for the past several years.

At its spring meeting here May 9-11, the first under the chairmanship of Gov. Frank Carlson of Kansas, the economics advisory committee brought in a report consisting of a statistical review of oil activities during the first 4 months of this year and containing no discussion of current conditions or future trends.

This was in compliance with a suggestion from Carlson, but caused a near revolt in the committee.

Unlike most other committees of the Compact, which are appointed by the governors of the member states, the economics advisory committee is appointed by the commission chairman and is composed of economists in the employ of oil companies and associations. This has caused criticism in some quarters, such as the Wherry committee of the United States Senate, that the compact is dominated by the industry and, also, that it provides a mechanism by which the major companies can get together to control production.

Assignment Changed

The Compact expires in 1951 and must be presented to the next session of Congress for renewal, and many of the commission's officials feel that every possible step should be taken to avoid any attack on the score of domination by the industry. There was thought of dropping the economics advisory committee entirely, but shortly before this meeting Governor Carlson reappointed the entire group but with a different assignment. A number of the committee members wanted to disband on the ground that a purely historical report would not be worth their time and expense in attending meetings, but after some discussion it was voted to continue on the new basis.

The Compact's forecasts were started during the war when the oil-producing states needed all possible advice and assistance in increasing production to meet anticipated military and civilian requirements. While the committee's reports were purely advisory, they were of great value to the industry in planning operations for the ensuing months. There was some feeling among Compact members that the committee has outlived its usefulness now that supply is fully adequate to meet all demands.

In another step away from close association with the industry, several governors, notably those of Texas and Kansas, have appointed only state officials or employes to membership on the various Compact committees. However, the smaller producing states, and those without large conservation commissions, are continuing to appoint specialists from the industry to represent them on committees, and there appears to be no general move to force complete discontinuance of this practice.

To Stick to Conservation

However, at the Jacksonville meeting there was definite evidence that leaders in the commission are anxious to confine Compact activities to conservation problems of the state governments and divorce themselves from any suspicion of industry influence. As one official put it: "The regulators and the regulated should not sit down together."

In reviewing the first 4 months of 1949, the economics advisory committee reported that total domestic and export demand for petroleum and its products has been 113,000 bbl. daily or about 2 per cent less than in the similar period of 1948, in spite of the fact that demand for gasoline has continued to show a substantial gain. Total domestic demand, it was stated, has been less than anticipated due to some slackening in business activity, and because of unexpected warm weather east of the Mississippi River during the heating season.

The committee estimated normal winter weather in the East would have caused domestic demand to be about 100,000 bbl. a day larger. "Another factor that must be kept in mind in comparing demand during 1948 and 1949 is the change in the pattern on the part of consumers and distributors," the committee report stated. "Early in 1948 the supply situation was so tight that all purchasers were eager to secure supplies promptly, whereas recently with abundant supplies in sight there is evidence that buying has been deferred by many purchasers."

A bitter attack on the attempt of the federal Government to invade the prerogatives of the states in regulation of oil and gas industry, and to substitute government operation for individual initiative was made by Gov. Frank Carlson of Kansas in his report as chairman of the Compact Commission.

Nationalization Attacked

"For nearly two decades," he said, "Our national Government has conducted a destructive drive against the system under which our American creative spirits have developed. Free enterprise has been insidiously attacked. Our national Government would now replace the system which has made us what we are with a paternalistic nationalization, which history reveals is a destroyer of human rights and freedom.

"Insofar as our oil and gas industry is concerned, the drive of our centralized Government now takes the form of three major offensives: the commandeering of tidelands oil of the coastal states, the replacement of state regulation of oil by federal regulation, and bureaucratic control over the price received for natural gas by independent producers not connected with interstate commerce transportation."

Turning boldly to the delicate subject of price, Carlson made a vigorous defense of market proration. He pointed out that localized shortages at the close of the war set off a drive by the national Government against state regulation, but "the temporary local shortages, so eagerly seized upon for criticism, vanished into thin air as the oil industry quickly rallied," and he continued:

"The complaint against state regulation, left groundless on this issue, then shifted to the cry that the state limit supply to demand solely for the purpose of maintaining prices. No one familiar with the years of trial and error in the legal and technical development of state regulation in oil-field control can believe this charge. The need for limiting supply to demand was a bitter issue for years, and advocates for and against limiting supply to demand existed both within the industry and in state governments. That preventing waste of petroleum depends upon adjusting supply to demand was learned the hard way, through experience. State statutes evolved only after bitter conflict between belligerent segments of the industry.

"It has been developed throughout the years that production in excess of market demand means unnecessary storage, resulting in evaporation and waste.

Asks "Adequate" Price

"An adequate price is required to prevent waste. This has been forcefully brought to the attention of the state regulatory bodies. An adequate price is necessary to keep in operation the multitudinous small oil wells. These wells have often been designed as the backbone of the oil-producing industry because they represent such

a large proportion of the oil reserves."

Carlson was particularly vehement in his attack on "the majority leader" (Commissioner Olds) of the Federal Power Commission for his declared intention to regulate gas production and particularly the well-head price of natural gas.

Declaring that there is a wide gap between present prices for gas and fuels with which it should be competitive. He pointed out that three of our greatest gas-producing states are attempting to raise the price of gas at the well head to avoid the waste of a natural resource being sold at a price conducive to waste.

Import Restrictions Asked

Federal legislation to restrict imports of foreign petroleum must be demanded by the oil-producing states unless imports are kept to a level to supplement domestic supply, it was declared by Gov. Sid McMath of Arkansas.

This came at the close of a speech extolling Arkansas' conservation law as a model for other states and as being responsible for increasing reserves which belied forecasts of federal officials that we were running out of oil. McMath praised Texas for cutting back production to market demand but added that we will not have the reserves for another emergency if our domestic oil industry in peace is caused to stagmate by a flood of foreign oil.

"Given a favorable economic climate, the idea that we will ever run out of oil on this continent is patently ridiculous," McMath said.

"Today our known petroleum reserves are at an all-time high. Since 1930 we have added to these reserves (which we should really just consider as underground working stocks) a volume equal to all that we consumed plus an additional 50 per cent. Our reserves are now twice what they were in 1928 when the prophets of doom were hanging crepe on the industry.

"They are also great in some other parts of the world. Therein lies a danger to the full and effective functioning of our domestic industry. It is today a principal threat. Along with the development of our oil resources we have developed an enormous demand for the products of petroleum. The counterpart of this does not exist anywhere else on earth. It is tempting both to companies which have concessions in other countries and to the governments of those countries which are intent on turning their oil into cash.

"Our oil producers cannot continue to explore and develop if they are displaced in their own market. The full burden of reducing production when necessary to prevent above-ground physical waste and economic waste must not fall solely upon the states which are represented here today. If imports are not brought into balance to supplement rather than supplant domestic production, then it will become our duty to ask the federal Government to restrict the flow of foreign oil by import quotas or excise taxes in order that we may continue to fulfill our responsibilities."

In an address on the proper relation between states and the federal Government in oil and gas conservation, U. S. Sen. Andrew F. Schoeppel of Kansas said: "The public interest, which is the paramount consideration in this field, is not to be served by having the conservation of oil and gas considered a contest wherein the federal Government on the one hand is pitted against the states on the other. It must be a cooperative effort, with common objectives."

Schoeppel said the primary responsibility rests with the states and they are better adapted to localized control, but that federal powers must be used in some cases, such as control of imports.

Half of Cars Now Require Premium Gasoline, A.P.I. Marketing Men Told

ST. LOUIS.—About half of all cars on the road require premium gasoline for knock-free performance, Julian J. Frey, general sales manager of Ethyl Corp., told the Marketing Division of the American Petroleum Institute at its meeting here May 10.

Citing independent surveys by Socony-Vacuum Oil Co., Inc., Shell Oil Co., Inc., and Ethyl Corp., Frey declared the data accumulated "indicate that only 30 to 50 per cent of the present car population will be free of knock on the current regular grades of motor fuels."

Three factors, he said, insure a continuing great demand for premium fuel: (1) The increasing number of new cars which are being designed specifically for operation on premium gasoline; (2) the wide variation in octane requirements among automobiles of the same make and model; and (3) the higher octane requirements of the average car as it accumulates mileage.

Declaring that the automotive industry is now entering a significant new cycle of engine improvement, Frey said the fueling of the new engines "will entail the production of a great quantity of gasoline of substantially higher antiknock value than now produced."

Two manufacturers, he said, already have incorporated the basic designs of the new engines in their 1949 models. While these manufacturers state that the new engines require fuels with a research-octane number of 88 or higher, they actually were designed for higher-octane fuels but were derated "to accommodate them to the antiknock level of the premium fuels sufficiently available now.

"Thus," he stated, "a continuing demand for gasoline of high antiknock quality may be foreseen."

In another talk, Rep. Oren Harris, chairman of the subcommittee on petroleum and federal power of the House committee on interstate and foreign commerce, told the marketing men the time has come when a definite national petroleum policy should be determined by the Government.

"It should be," he said, "a policy that sharply defines the extent of controls by state and federal governments; or if you will, the nonnecessity for any such controls."

At present there is "confusion of thinking and practice concerning the degree to which natural gas becomes a public utility and subject to such types of controls, or to what extent it is a source of energy like coal and petroleum, which have had less degree of regulation," he said. "But, here, too, is an absence of a national policy, and a degree of ineffectiveness in whatever the present policies may be concerning the respective agencies of regulation, whether state or federal, owing to recent court decisions."

Present controls, he declared, were imposed and exercised on a piecemeal basis, to meet the exigencies of a specific situation, without regard to the over-all picture.

Texas House Passes Carbon Black-From-Gas Bill

AUSTIN.—The Texas House of Representatives last week passed H. A. Hull's bill allowing natural gas as well as sour, or oil-well gas, to be made into carbon black if the producer receives the prevailing "light and fuel" gas price.

As amended, the bill permits the manufacture of carbon black only from gas with less than ¾ gal. of liquids per 1,000 cu. ft. Wet gas would be required to be stripped of its butane, propane, and other liquids before the dry-residue gas is burned into carbon black. The bill, which would extend to other areas a law now restricted to the Panhandle field, now goes to the senate.

Sen. George Moffett's oil unitization bill received considerable support last week but failed to reach a final vote.

Texas Commission Will Begin Underground-Waste Studies

by D. H. Stormont

DALLAS.—The Railroad Commission will soon hold its first hearing on a Texas oil field for the purpose of determining why such poor oil recovery is being obtained and to see what can be done toward improving the yield.

This announcement was made May 6 by its chairman, W. J. Murray, in an address before the weekly luncheon meeting of the Petroleum Engineers Club of Dallas. Murray declined to name the field, but he did say it is in the East Texas district and that the commission had made plans for the hearing.

It would not be a "show-cause" hearing, he explained, but just an invitation for the operators in that field to meet with the commission and seek to determine why the oil recovery there is so low. He added that if the inquiry were successful similar hearings probably would follow on other Texas fields in an effort to reduce underground waste of oil in Texas.

By underground waste of oil, Murray meant the additional crude which could be recovered if known methods of secondary, or improved primary, recovery methods were placed in operation. He emphasized that these operations would have to be economically feasible before the commission would take steps toward having such waste eliminated. In his opinion, the commission has sufficient legal authority to shut in any oil field where preventable underground oil waste is taking place. It is hoped, he said, that the industry will go ahead with improved recovery operations on its own volition and that the commission would have to act only as an arbitrator.

"There is no legal reason to believe that the courts would not interpret the underground loss of oil as much a waste as the flaring of gas. And there is no legal reason to believe that they will not hold the commission has the power to shut in such fields where wasteful recovery practices are followed. Some coercion may be needed, but I have found the oil industry is anxious to cooperate in all phases of conservation. Most conservation projects are financially sound—they show a profit in the end."

When asked what "yardstick" would be applied in determining when preventable underground waste was taking place, Murray said that the only yardstick would be the opinions of engineers as to whether or not underground waste was taking place and if it would be economical to recover the additional oil. No flat percentage recovery figure, even within a specific area, would be applicable, he said; it would depend entirely upon the field in question.

Murray also brought out the progress made in reducing residue gas flared at gasoline plants in Texas. In March 1945, Texas plants processed 1,211,000 M.c.f. daily, of which 326,000 M.c.f. were flared as residue gas. He contrasted these figures with the record of March 1949, in which 1,810,000 M.c.f. of gas were processed and only 47,000 M.c.f. of gas flared daily.

Stockpiling of Lubricating Oils Urged

WASHINGTON.—The National Petroleum Association last week urged the Armed Services Petroleum Board to institute a program of petroleum stockpiling, starting with lubricating products.

A brief filed with the board outlined the serious situation in which Pennsylvania-grade producers currently find themselves, which has resulted in a great increase in abandonments with a consequent loss of oil reserves.

The board was told that prices of bright stock and other lube fractions from which lubricants are made have dropped more than 50 per cent, making it apparent that lubricating oils could be purchased at a considerable saving in cost to the Government if a stockpiling program were undertaken. The stockpiling of finished products, it was pointed out, was disclosed to be under consideration a year ago.

"This action would have the effect of relieving an abnormal market condition which now is conducive to depressing the market structure to the point where additional millions of barrels of oil will be lost in reserves through the premature abandonment of wells," the NPA declared.

"We hope and trust that World War III may never become a reality. If this nation is ever again plunged into war, petroleum will play an even greater role in gaining ultimate victory than it did in either World War I or World War II. The increased mechanization of our war machine will place even greater emphasis upon the need for high-grade lubricants.

"Any action your board may be able to take at this time would not only make available to the armed services a ready supply of high-grade lubricants, but it would be safeguarding future supply of irreplaceable crude stocks to meet our vital defense needs."

A survey of the situation by the association disclosed that Pennsylvania-grade producers in Ohio believe that abandonments there this year will be more than double those of 1948, increasing the loss of reserves over last year by 1,250,000 to 1,500,000 bbl.

Request of I.P.A.A. for Imports Study Denied

WASHINGTON. — The Tariff Commission last week dismissed the application of the Independent Petroleum Association of America for an investigation of oil imports with a view to applying the escape clause of the reciprocal trade agreement. In announcing its action, however, it disclosed that two members believe there may be merit in the association's complaint.

Although it refused to take action at this time, the commission said it would continue to observe further developments in the industry and left the way open for further consideration of the matter should an investigation prove warranted at some future time.

The commission held that the situation of which the I.P.A.A. complained was the result of factors other than the reduction of import taxes.

"Because of a scarcity of petroleum products in eastern seaboard areas of the United States in the winter of 1947-48," it said, "the oil industry made strong efforts to insure adequate supplies for the past winter (1948-49). Both production and imports were increased, while exports (which were subject to Government controls) were decreased. Owing, however, to the mildness of the weather during the past winter, supplies (especially of fuel oil) proved more than adequate, and inventories both of crude petroleum and of refined petroleum products increased. The present situation with respect to inventories, which has resulted in some current scaling down of both production and imports, thus appears to have been due almost wholly to factors other than past changes in the duty."

_____this week

GOVERNMENT—Bureau of Mines demonstrates two new coal-to-oil plants at Louisiana, Mo. . . . ¶Texas Railroad Commission announces plans to conduct investigations into losses of oil through poor recovery methods. . . . ¶Tariff Commission denies I.P.A.A. request for investigation into imports situation. . . . ¶Robert Friedman refuses post as head of OGD, will leave government service. . . .

INDUSTRY—Economics Advisory Committee of Interstate Oil Compact Commission, at request of Governor Carlson, drops annual supply-demand study. . . . ¶Penn-Grade producers urge stockpiling of lubricating oils to take up slack in weak market. . . . ¶Natural-gas pipe-line expansion program to cost billion dollars, Natural Gas Department of the American Gas Association is told. . . .

INTERNATIONAL—Creole Petroleum and Pantepec Oil reach new agreement; will cease joint operation of three fields in Eastern Venezuela. . . . ¶Britain's chemicals industry undergoing major expansion program. . . . ¶Russia reported unable to meet crude-oil output goals due to lack of equipment. . . . ¶Colombian oil firm, operated jointly, is dissolved. . . . ¶French petroleum-technician group to resume regular meetings in June. . . .

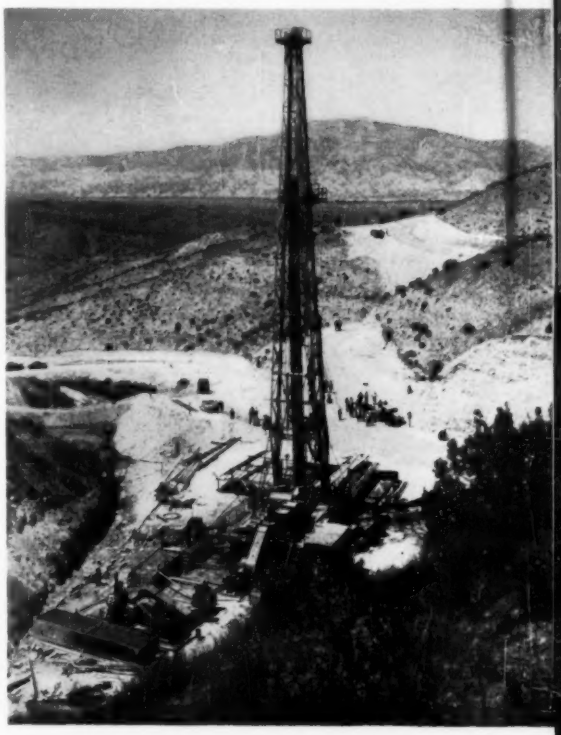
PIPE LINES—Construction on Trunkline Gas Supply Co.'s 711-mile, 26-in. line from Edge, Tex., to Palmyra, Neb., to begin by July 1, 1950. . . . Project scheduled for completion by October 1951. . . . ¶Pipe-line crews in Argentina finish 60-mile section of 1,100-mile, 10-in. line. . . . ¶Empire Pipe Line Co. buys portion of Phillips Pipe Line Co. gathering system. . . .

TRENDS—Daily average crude-oil production for week ended May 7 was 4,910,000 bbl., indicating a probable average for this month of about 4,920,000 bbl. . . . Estimated production of all light hydrocarbons and imports at the current rate will bring total new supply for the month to about 5,875,000 bbl. daily or about 50,000 bbl. per day less than total demand for last May. . . . This indicates an over-all stock reduction for the month compared with the stock gain of 13,700,000 bbl. during May of last year. . . . ¶Gasoline demands continue strong. . . . Esso Standard Oil Co. has resumed its system of maximum price guarantees over an extended period to contract buyers of heavy fuel oil. . . . Other suppliers are expected to follow. . . .

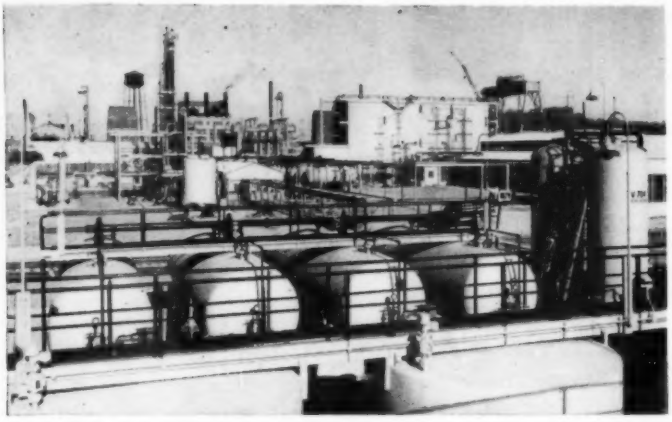
REFINING—New automotive research laboratory at Curtis Bay, Md., is dedicated. . . . ¶Cities Service awards contracts for construction of $4,000,000 compound plant at Cicero, Ill. . . . ¶Phillips Petroleum Co. opens new 1,500-bbl. daily blending and packaging plant at Kansas City, Kans. . . .

NATURAL GAS—FPC authorizes two companies to construct natural-gas line to Atomic Energy Commission plant at Oak Ridge, Tenn. . . . ¶Manufacturers Light & Heat Co. directed by FPC to connect its natural-gas facilities with those of Waynesboro Gas Co. . . .

NATURAL GASOLINE—In Texas Brazos River Gas Co. is to construct Palo Pinto County's first natural-gasoline plant near Mineral Wells. . . . ¶Slaughter gasoline plant to be dedicated at Sundown, Tex., May 16. . . .



The third prolific discovery well in California's barren Cuyama Valley has been brought in by Richfield Oil Corp. The 81-35 Hcman, shown here, had a reported initial production of 5,088 bbl. per day and 3 hours after being brought in was gaged at 1,430 bbl. per day of 34.2 gravity oil through a ½-in. choke. The new well is located in northeastern Santa Barbara County. It was brought in from a sand topped at 4,091 ft. and bottomed at 4,392 ft. The sand is well saturated and has a high gas content



This view of the Bureau of Mines coal hydrogenation plant shows the product storage tanks, foreground, distillation facilities, left, and the converter stalls, right

Two New Coal-to-Oil Plants Are Demonstrated by Mines Bureau

by R. B. Tuttle

LOUISIANA, Mo. — Two different processing methods for converting coal and lignite to synthetic liquid fuels were demonstrated to oil company and other executives and operating personnel by Bureau of Mines engineers here May 8.

Built for the Department of the Interior at a combined cost of $15,000,000, these synthetic fuels plants are similar in basic design to those developed by German technicians to supply Nazi wartime needs. Due to American developments, however, these Bureau of Mines plants differ greatly in both equipment and operational procedures. Currently the coal-to-oil demonstration plants located near Louisiana, 75 miles northwest of St. Louis, are operating on Western coals. Later, other coals and lignites of the nation may be processed.

The two processes operated at Louisiana in combination produce liquid hydrocarbons ranging from heavy fuel oils to jet fuels and aviation gasoline. Aims of the bureau are to demonstrate the merits of the two methods for converting American coals to oils. The hydrogenation unit, first of the plants to be placed in operation, is based on the Bergius-I. G. Farben process. Design of the gas-synthesis unit is a modification of the Fischer-Tropsch process.

The Hydrogenation Plant

First of the new units to be completed for operation was the 200 to 300-bbl. daily hydrogenator. This plant, built under contract by Bechtel Corp. for $10,000,000, is designed to operate at pressures up to 10,300 psi. Actual production capacity of the hydrogenation plant is dependent on the coal and catalyst used. Operations are carried out in two major steps, the first for liquefaction of coal and the second for converting the liquefied coal to gasoline and byproducts. Separately or simultaneously the process produces liquid fuels ranging from high-octane aviation gasoline to bunker C oil.

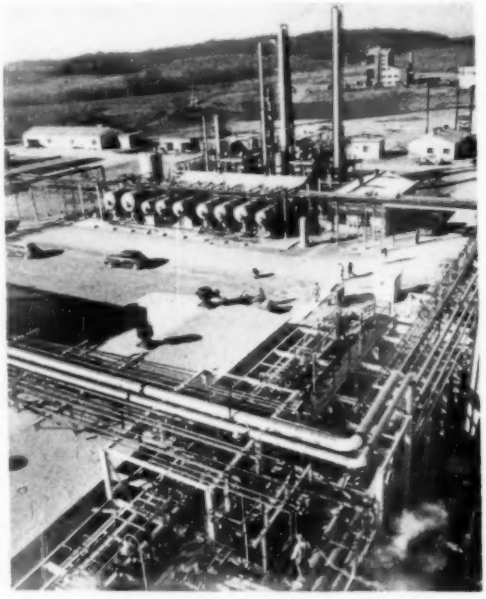
A portion of the diesel oil produced in a 2-day run of the new plant was used as the fuel for operating the Burlington Route diesel locomotive making a round-trip test run from St. Louis to Louisiana. A Bureau of Mines analysis of the diesel fuel shows its specifications to be as follows:

Gravity (A.P.I.)	38.5
Viscosity at 100° F. (S.F.)	33.5
Carbonization residue (per cent)	.06
Ash (per cent)	.002
Flash (°F.)	196
Water and sediment	trace
Pour point (°F.)	10
Aniline point (°F.)	149.7
Diesel index (within 2 per cent of cetane number)	57.7
Distillation:	
Initial boiling point (°F.)	414
10 per cent point (°F.)	442
90 per cent point (°F.)	582
End point (°F.)	628

From 120,000 to 200,000 cu. ft. per hour of hydrogen is required for processing operations in the hydrogenation plant. This material and inert gas is manufactured in nearby equipment of the former Missouri Ordnance Works by cracking natural gas. Steam, water, electricity, and other services for operating the demonstration units also are obtained from the old ordnance plant facilities.

The bureau's hydrogenation process employs six converters weighing approximately 100 tons each when assembled. Wall thickness of these forged steel, 32-in. i.d. vessels is 8¾ in. and their height is more than 42 ft. over all. Each of the two units in the process employs three converters, two in the liquid phase and one in the vapor phase, all of which are located in a heavy, reinforced concrete structure. Divided into six compartments by a 14-in. concrete wall

(Continued on page 159)



The coal hydrogenation plant operated by the Bureau of Mines at Louisiana, Mo. Distillation equipment for the process is located in the upper center in this view of the demonstration plant. The gasification plant may be seen in background, right

New Gas Lines to Cost Billion Dollars, A.G.A. Group Is Told

by Paul Reed

FRENCH LICK.—In opening the spring meeting of the Natural Gas Department of the American Gas Association here May 9, R. W. Hendee, president of Colorado Interstate Gas Co. and president of A.G.A., pointed out that the natural-gas industry, now with reserves of 174 trillion cubic feet, is increasing its sales at such a rate that it is fast endangering the high percentage of sales for the entire gas industry.

Progress in combating the waste of flare gas in Texas was cited by William J. Murray, Jr., chairman of the Texas Railroad Commission. The amount flared has been reduced to less than 47 million cubic feet today from plants receiving more than 1 billion daily, he said.

Studies in operating the trans-California 214-mile, 30-in. line, discussed by W. C. Mosteller, of Southern Counties Gas Co., show that flow-efficiency determinations are within the 83-88 per cent range anticipated in designing for the present capacity throughput of 305,000,000 cu. ft. daily.

Estimates of probable costs prepared by Frank E. Richardson, Texas Eastern Transmission Corp., indicate that the total expense of building natural-gas pipe-line projects planned for 1949 and the future would be approximately $977,250,000. Of this amount, $288,943,000 would be paid to contractors and about $536,192,000 would be paid for pipe.

Costs Figured

These estimates were reached by considering all planned gas lines in terms of 24-in. diameter, ⅜-in. wall pipe weighing 188.1 tons per mile, which would be equivalent to 19,545 miles. Costs were figured on bases of $142 per ton mile for pipe and $2.80 per foot for laying. By adding the cost of compressors for these projects the total for all expenses would be close to the previous estimate of 1 billion dollars given by Robert W. Hendee. Because of the need of condensing his discussion of operations and contracts Richardson did not present these cost estimates fully in his paper. To lay this 19,545 miles of equivalent 24-in. by spreads operating on average 50-mile sections, 390 spread contracts will be required.

In addition to discussing recent centrifugal compressor installations and the future possibilities of axial flow compressors, attention was directed to innovations in prime movers beyond the present use of electric motors and experiments being conducted with gas turbines. It appears that a further step is likely to be made by the application of high-speed steam turbines for driving centrifugal compressors on gas-line projects under consideration. Advantages would result from the fact that equipment could be concentrated in a few units with lower initial and operating costs. These, together with the lighter foundations required, would have to offset the comparatively low-efficiency characteristic of steam turbines.

The convention was held under the direction of D. A. Hulcy, Lone Star Gas Co., second vice president of A.G.A. and chairman of the Natural Gas Department, and George H. Smith, assistant managing director of A.G.A. E. F. Schmidt, Lone Star Gas Co., is chairman of the program committee.

Arguments on Tidelands Heard by Supreme Court

WASHINGTON.—The Supreme Court heard arguments May 9 on whether the federal Government should be permitted to file its proposed suits for seizure of the Texas and Louisiana tidelands.

Law officials of the two states presented separate arguments why the suits should not be filed, Louisiana contending that the Constitution vested the federal Government with no authority to sue a state without its consent, Texas that Congress first should assert federal jurisdiction over the tidelands, both in essence telling the court it was without jurisdiction to decide the issue of tideland ownership.

Counsel for Louisiana told the court that while a number of cases have been decided involving suits against states by the federal Government the states, by filing appearances, had voluntarily consented to be sued. But those cases, it was contended, did not vitiate the principle that there is no superiority of federal sovereignty over that of the states. This case, it was declared, is the first in which a state has raised the point of immunity, but failure to do so heretofore did not constitute a waiver of any rights under the Constitution.

The Texas contention was that until Congress acted there was no issue which properly could be brought before the court, and consideration of the rights of Congress. Further, it was argued, if Congress does act to assert federal jurisdiction, any proceedings should be brought in courts within the state, which would have the advantages of familiarity with real-property laws based on Spanish and Mexican law and proximity to witnesses and documents.

The only further action to be expected during the current court term, which closes next month, will be an order announcing whether the federal Government may file the suit. If the Government wins that right, the actual issue of tidelands ownership will come up for argument next winter.

Friedman Refuses OGD Job; To Leave Federal Service

WASHINGTON.—Robert E. Friedman, acting director of the Oil and Gas Division, has declined the nomination tendered him by the National Petroleum Council as permanent head of that agency and will leave the Government service within the next month or 6 weeks.

Friedman, who served in the Petroleum Administration for War and joined the OGD as chief counsel when it was set up, took over as acting head following the resignation last year of Max W. Ball.

Although Friedman has not yet announced what he will do, it has been rumored he is planning to join one of the newer pipe-line companies.

Friedman's decision not to accept the top OGD post leaves Interior Secretary J. A. Krug and the NPC, which he asked to submit nominations, in a quandary since energetic efforts over the past 6 months to find a successor for Ball have not succeeded in finding any man of prominence in the oil industry who would be willing to take the $10,000-a-year job.

Oil Union to Seek 36-Hour Week Without Pay Cut

Oil Workers International Union (C.I.O.) will seek a 36-hour instead of a 40-hour work week, it has been announced in Denver. The shorter work week will be sought without reduction in take-home pay.

The proposal was approved unanimously by the union's national-policy committee May 9, and it will be sent to affiliated groups now holding contracts for more than 100,000 workers in oil production, transportation, refining, and marketing.

The union based its call for shorter hours on "the need for maintaining full employment."

International

WORLD-WIDE OIL DEVELOPMENTS

Creole, Pantepec Put End to Joint Operation of Oil Fields

CREOLE PETROLEUM CORP. and Pantepec Oil Co., C.A., have reached a new agreement under which interests in three formerly joint producing fields in Eastern Venezuela will be divided and operations conducted on a separate basis.

The areas involved are Mulata, El Roble, and Temblador. Creole held a half interest, as operator on the concessions with the remaining interest in Pantepec. Creole elected to take advantage of a provision in the old contract allowing termination of the agreement by either party after April 14, 1949.

Reports are that Creole and Pantepec disagreed on the long-term prospects and reserves at El Roble. Overall cutbacks by Creole in its operating program affecting these areas also were at issue.

Under the new contract Mulata and El Roble are to be divided on a checkerboard basis. The blocks are being evaluated, and the amount received by the companies based on reserves and other considerations. Pantepec is to receive two additional parcels of 1,250 acres in exchange for its half of the TR and TRN (Temblador) concessions.

Under the new agreement, Creole will install two additional rigs before August of this year and keep five heavy rigs operating on Pantepec's share of El Roble, drilling for Pantepec's account up to 18 wells by August 1951. Creole also will operate one rig in Mulata.

Creole will continue to operate the properties until the end of 1951 after which, according to the Pantepec announcement, "unit operation will be determined by mutual agreement." Pantepec will take up to $3,000,000 in bank credit, if desired, for accelerated development of El Roble.

Daily average production in the three fields for the week ended April 8 was: Mulata 18,500 bbl., Roble 5,200 bbl., and Temblador 200 bbl. The figure for Temblador refers to the Creole-Pantepec interest. Acreage in the fields, total and proved, is reported as follows: Mulata 9,900 and 7,700; Roble 14,400 and 8,700, and Temblador 5,600 and 4,000.

Colombian Field Shut in For Lack of Market Outlets

Further indicating the decline in demand for heavy fuel-oil type crudes, it is reported that Socony-Vacuum Oil Co.'s Cantagallo field in Colombia has been shut in for lack of an outlet in world markets.

The field's February production was reported at about 1,000 bbl. daily. The 21°-gravity production is moved to tidewater at Mamonal through the Andian National Corp., Ltd.'s common-carrier line originating in De Mares concession. This capacity in the line presumably will be released for additional production from Shell's Casabe field now producing about 19,000 bbl. daily against an estimated potential of 25,000 bbl. daily.

The Andian line also moves about 5,000 bbl. daily from Shell's Dificil field as well as approximately 15,000 bbl. daily of crude and reduced crude from De Mares. Plans call for eight additional pump stations along the Andian line to step up its capacity which has been reduced as a result of the lower gravity of the oil transported.

New Emsland Discovery Considered Promising

German oil circles are attaching some importance to an apparent new discovery a few miles northwest of the town of Lingen in the Emsland area of Western Germany.

The wildcat or stepout Ruehlertwist 2 of Wintershall, A.G., encountered the Bentheimer sand, porous and oil impregnated, below 2,255 ft. The latest report on this operation said that after casing was run drilling would be continued through the formation and a production test made.

The well is on the Georgsdorf concession in which four German companies, including Wintershall, hold joint interest. The other companies are Gewerkschaft Elwerath, Preussag, and C. Deilmann.

The Bentheimer sand is productive elsewhere in the Emsland area. The formation found by the Ruehlertwist well was regarded as the prolongation of the Coevoorden-Schoonebeek structure. The Emsland area, with an estimated 68 per cent of Germany's reserves, is the most promising part of the country, and German operators are hoping that the new well will lead to major production such as that developed by the Dutch at Schoonebeek.

General Meetings to Be Resumed by A.F.T.P.

THE Association Francaise des Techniciens du Petrole is resuming its general meetings and has scheduled a 6-day program beginning June 20 in Paris centered on the subject, "Petroleum As Raw Material for Chemical Industry."

A.F.T.P., which held its last previous meeting in Paris in 1945, consists of engineers and chemists, as well as management officials, of the French petroleum industry and has the objective of promoting a mutual interchange of information.

French, British, and American speakers are listed on the program of the forthcoming meeting. The general subject of petrochemistry points to the increasing interest among French refiners in the possibilities of chemical manufacture, a development already fairly well advanced in Great Britain.

The specialized conferences will deal with the following four subjects: solvents and plasticizers; plastics, synthetic fibers, and synthetic rubber; insecticides and agricultural chemicals; and surface-active agents and detergents.

The association is inviting the attendance of any United States oil-industry technicians or officials interested in the meeting and who may be in Paris at the time.

Russia, In Need of Equipment, Unable to Meet Output Goals

HAMPERED by a shortage of equipment and transportation facilities, including tankers, Soviet Russia is falling short of meeting its current goal for crude-oil production.

Some of the difficulties encountered by the Russian oil industry were mentioned in a recent speech given by Nikolai Konstantinovich Baibakov, minister of oil. The talk published in the Soviet Monitor in London still gave no actual figures on current Russian output, but it disclosed that in Baku, particularly, last year's work of the state oil administration was unsatisfactory.

Baibakov said 1948 production was 13 per cent above 1947 but still short of the goal. He said Baku is still the most important oil-producing region in the Soviet Union but that in the basic district we have not overcome serious difficulties connected with the exploitation of new oil deposits. . . ." Drilling equipment is needed, and tankers are lacking to transport oil from submerged wells.

Scientific research organizations working for the oil industry in Russia are seriously lagging in their work, the ministry said, and the housing plan for oil workers last year reached only 73 per cent of its goal.

Russia's production is a subject of speculation. Estimates for output in 1948 range from 550,000 to 625,000 bbl. daily, though a figure of about 600,000 bbl. daily is generally accepted. With this production Russia only last year came back to the level of prewar 1939 when output was 585,000 bbl. daily. Of this, approximately 410,000 bbl. daily came from the Baku region. Russia's announced production goal in 1950 is slightly more than 700,000 bbl. daily.

Joint Colombian Oil Firm Dissolved

THE second joint Tropical Oil Co.-Colombian national oil exploration venture has been liquidated after three unsuccessful wells, but the joint-capital arrangement may be continued after reorganization.

The company involved is Cia. de Petroleos Ariguani, S.A., owned equally by Tropical, an International Petroleum Co. subsidiary, and Colombian nationals, among them mining and tobacco interests. Cia. Ariguani was formed in 1944 with a capital of 4,275,000 ps. and held eight concessions on option from Tropical. Concessions totaled 3,329,000 acres.

Three wildcats were drilled, one in the Costa Rica block and two in the Granada area. At the end of last year, total losses reached $3,218,000, and since this was more than 50 per cent of the capital, liquidation is now in progress. However, it is understood that efforts are being made to continue this type of joint exploration operation which offers Colombian capital a direct stake in the business.

The two wells drilled by Cia. Ariguani are some 25 km. west of Shell's El Dificil field. The first joint Tropical-Colombian company was Soc. Nacional del Carare which was organized in 1937 and drilled two wildcats about 125 miles up the Magdalena Valley from Barranca Bermeja. This company also was liquidated after its unsuccessful drilling.

Cia. Ariguani some time ago studied the possibility of taking over De Mares concession on its expiration and lapse to the government August 25, 1951. This was dropped after the Colombian Congress enacted the law authorizing an official or semiofficial company to take over the concession.

440 Dwellings Built by International in Peru

Approximately 440 new dwellings for Peruvian workers have been completed since the end of the war by International Petroleum Co. as a part of its long-range housing construction program which is expected to continue at least several more years.

The entire program contemplates the construction of possibly 3,800 to 4,000 dwellings. The work has been hampered somewhat by exchange difficulties. International has completed about 20 dwellings for its expatriate staff since the end of the war, and has 15 more scheduled for this year.

This work is at Talara on the La Brea-Parinas Estate which International owns in fee. With the new housing construction, activities of the company in the area are being consolidated at Talara, making for economies through joint machine-shop, garage, and other facilities.

International

Ule--Amuay Line to Reach Full Capacity in Mid-June

Creole Petroleum Corp.'s 24 and 26-in. crude-oil pipe line from Ule, on Lake Maracaibo, to Amuay Bay in Venezuela is scheduled to reach full capacity throughput of 325,000 bbl. daily about June 15.

The intermediate pump station at Dabajuro has been completed, and capacity operation will begin after further cleaning and testing. The pipe line now is carrying about 250,000 bbl. daily.

The Creole line, itself, was completed late last year. The line will handle most of the company's present production from the Lake Maracaibo area, which for February averaged about 367,800 bbl. daily. The project's cost is estimated at $48,000,000, but the company expects important savings over the higher cost of transportation by lake tanker.

Early Approval of Tapline Right-of-Way Predicted

Press dispatches from Damascus last week said Brigadier Husni Zayim, Syrian military governor, is expected in the next 2 weeks to grant right-of-way permission for the Trans-Arabian Pipe Line Co. line.

There was some speculation over the question of whether such permission would be acceptable in the absence of United States recognition of the Syrian regime. Zayim is the leader of an Army group which took over the government late in March.

The lack of a Syrian right-of-way agreement appears to be the final major obstacle facing the Tapline. An agreement was on the verge of ratification by the parliament before the Army took over. Trans-Arabian is continuing work on the southern end of the 1,067-mile 30 and 31-in. project in Saudi Arabia.

Bermudez Says Two New Drilling Contracts Signed

Petroleos Mexicanos is reported to have signed two more drilling contracts with private firms. Antonio J. Bermudez, Pemex director, said in Mexico City that both contracts provide for payment of 50 cents a barrel on new production with no return for dry holes.

The contracts are with Gustave A. Wiegand, San Antonio, Tex., and two Mexican companies jointly, Inversiones, S.A. and Petroleo y Sus Derivados, S.A. Pemex is to supervise the work and specify well locations.

Major Expansion Program Under Way Within Britain's Chemicals Industry

by Dahl M. Duff

BRITAIN'S chemical industry is at present engaged in a major expansion program, a large part of which is based on the use of petroleum as raw material for various synthesis processes.

Several large plants are now under construction, and the entire program is involving expenditures equivalent to several hundred million dollars. Development of a petrochemical industry in Britain complements the expansion now being made in the primary crude-oil refining industry, itself.

New plants in both the chemical and petroleum-refining fields are being encouraged by the government, since they will contribute to improving Britain's trade balance. The chemicals trade has expanded considerably since the war, and still further growth is expected to result from the new construction. Last year Britain exported about $335,000,000 in chemicals, drugs, and dyes compared to about $270,000,000 in 1947 and about $90,000,000 in 1938.

The chemical program now being carried out will allow Britain to reduce its dependence on the United States for some products. Last year, the United States exported about $40,000,000 worth of chemicals and allied products to Britain. Of this about a third was in carbon black, all of which is expected to be manufactured domestically when the new plants planned are in operation.

The increasing use of oil for the manufacture of chemicals parallels the trend of recent years in the United States, although the petrochemical industry in the United States draws on natural gas in many processes. Similar to installations on the Gulf Coast, some of the new British plants are being built to operate in conjunction with petroleum refineries.

Nationalization of "appropriate sections" of Britain's chemical industry was called for in the statement of Labor Party aims issued in London April 11. The statement only laid down general policy and gave no details, but it is a highly tentative manifesto which may be directed at heavy basic chemicals and not the more specialized petrochemical industry.

Three Oil Firms Involved

At least three oil companies—Royal Dutch-Shell, Anglo-Iranian Oil Co., Ltd., and Manchester Oil Refinery, Ltd.—are taking part in the new chemicals industry construction. American capital also is interested in some proposed projects, and the British Board of Trade said recently it would welcome and consider any proposals for American investment.

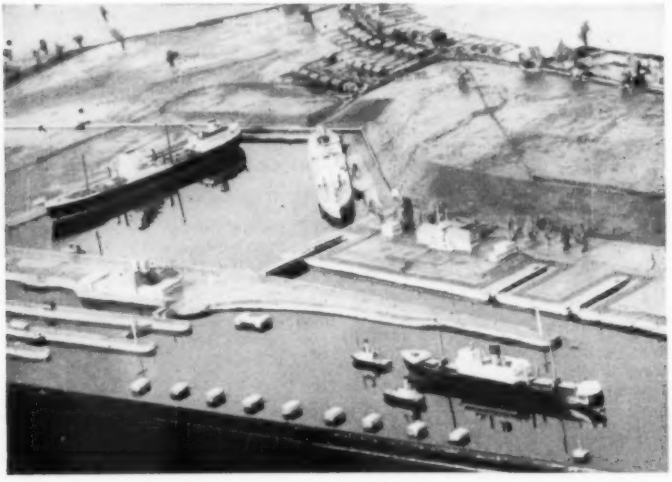
Imperial Chemical Industries, Ltd. (Nobel House, 2 Buckingham Gate, London, S.W.1) is spending a total of approximately $320,000,000 on new capital construction. The largest project of this company is at Wilton, Yorkshire, England, where about $68,000,000 is being invested in new facilities for the large-scale production of heavy organic chemicals from oil as well as coal.

Cracking Plant Planned

The project includes erection of a plant to crack petroleum for the manufacture of chemicals. In addition, an electrolytic chlorine caustic-soda plant and a vacuum salt plant will be built. A wide range of essential organic chemicals will be manufactured at Wilton. Among them are solvents for paints, cellulose lacquer, saccharin, drugs, raw materials for plastics, nylon fibers, and dyestuffs.

I.C.I.'s plant at Wilton will have a capacity to handle 350,000 tons a year of liquid feedstock and produce 35,000 tons a year of ethylene and other hydrocarbons. M. W. Kellogg Co. has the contract for the Wilton ethylene plant.

The construction at Wilton is the largest single industrial project thus far announced in Britain. The site is near Billingham where the largest chemical manufacturing plant in the British Commonwealth is located. The new plants will be tied into the Billingham works by a system of pipe lines nearly 10 miles in length and carried under the River Tees by a 1,750-ft. tunnel now under construction. About 3,000 workers are required for the construction of the Wilton project, and it is expected that more than 10,000 will be employed after completion. I.C.I. is giv-



The Shell organization has a major British refinery and chemical plant at Stanlow, on the Manchester Ship Canal. To meet the needs of these expanding plants, the Manchester Ship Canal Co. is planning a new oil dock with entrance lock and jetty at Eastham and other improvements costing about $16,000,000. Shown here is a model of the new dock which is designed to accommodate tankers of the 28,000 to 30,000-ton class

Construction at Partington, Cheshire, of the new plant of Petrochemicals, Ltd. The plant, now in initial operation, is designed to produce nearly 100 major chemicals from petroleum

ing considerable attention to the lay-out of the plants and the estate, and the southern half of the area is to be partly converted into playing fields for staff and workers.

Two other major I.C.I. projects consist of expansion of dye production and of the alkali-producing plants in the mid-Cheshire region. In the Cheshire area, capacity will be enlarged for the production of chlorine, explosives, polythene, textile filaments, and other materials.

First Units in Operation

Early this year the first units of the new petrochemicals plant of Petrochemicals, Ltd., (River Plate House, 12-13, South Place, London, E.C. 2) at Partington, near Manchester, went into operation. The plant is said to incorporate a number of novel features. It uses the Catarole cracking process initiated by Dr. Chaim Weizmann and Dr. E. Bergman, together with a group connected with Manchester Oil Refinery, Ltd.

The plant is to produce aromatic hydrocarbons and a wide range of olefins simultaneously from petroleum. Many of the products previously could be manufactured only from coal in small quantities and at high prices. The process uses gas oil and naphtha as raw material, and capacity of the plant at Partington is to be 75,000 tons of charging stock annually.

The company has exclusive rights for the process in the United Kingdom and many other countries. The site at Partington is substantially larger than is required for the Catarole plant alone, the plan being to provide space for construction of plants converting the chemicals into finished materials.

Chemicals reported now in production at Partington are: benzene, toluene, xylene, aromatic solvents and plasticizers, and pitch. By fall the following are to be available in bulk: isopropyl alcohol, isopropyl ether, ethylene oxide, ethylene glycol, naphthalene, hydrocarbon resins, and para-tertiary butyl phenol. By the end of the year, other units will be completed to produce such chemicals as polycyclic aromatics, propylene, derivates, acetone, and ethylene dichloride.

Anglo-Iranian Oil Co., Ltd. (Britannic House, Finsbury Circle, London, E.C. 2), largest oil producer in the Middle East, has taken definite steps to enter the petrochemical field. Together with The Distillers Co., it organized the British Petroleum Chemical Co. about a year ago. A petrochemical plant is to be built to operate in conjunction with the Grangemouth, Scotland, refinery of Scottish Oils, Ltd., an A.I.O.C. subsidiary.

The Shell organization, a leader in the petrochemical field in the United States, is engaged in enlarging its chemical operations in Britain. Shell Petroleum Co., Ltd. (St. Helen's Court, Great St. Helen's, London, E.C. 3), is now building an oil-cracking plant at Stanlow in Cheshire which is expected to go in operation about the middle of 1949. Cost is between $16,000,000 and $20,000,000.

Imports to Be Reduced

A large quantity of chemicals now being imported into Britain will be replaced when this new plant goes into operation. Initial production will be about 24,000 tons a year of a wide range of industrial solvents of a synthetic nature. Shell operates a refinery at Stanlow of present capacity of about 17,000 bbl. daily which is equipped with lubricating-oil and asphalt manufacturing facilities. Also at Stanlow, which is on the Manchester Ship Canal, Shell produces synthetic soaps and wetting agents from olefins. Though this production has recently been increased from 12,000 tons to 24,000 tons a year, further enlargement to 50,000 tons is planned.

Shell Petroleum's original announcement of expansion in the British petrochemical field was announced more than 2 years ago and no details have been disclosed since. The entire program involved a cracking plant at Thornton in Cheshire to produce 24,000 tons a year of aliphatic chemicals from olefins by cracking imported oil, the works at Stanlow, and an increase in the facilities at Shellhaven to produce 30,000 tons a year of products for insecticides and other chemicals for agriculture.

To Make Carbon Black

In the carbon-black field, a contract was let recently by Godfrey L. Cabot, Inc., Boston, for the construction of a plant at Ellesmere Port in Cheshire. Full operation is due in about 2 years with production from oil of about 10,000 tons of carbon black a year. Half the British company, Cabot Carbon, Ltd., is held by British investors. Carbon-black manufacture will be a new industry in Britain, and it involves American technical assistance and licenses for the use of American patents.

Monsanto Chemicals, Ltd., a subsidiary of the American firm, is making preparations for the manufacture of polystyrene in Britain. Reports are that styrene polymer will at first be imported from the United States but later made locally.

While this expansion in the chemical field is taking place, work is going forward on enlargement of four British refineries, and plans are being made for additions at several others. Construction is under way at the Shell refineries at Stanlow and at Shellhaven on the Thames; at Grangemouth, and at the Llandarcy refinery of National Oil Refineries, Ltd. (Anglo-Iranian).

As a result, British refining capacity, which was about 88,000 bbl. daily in 1937, will be increased to approximately 190,000 bbl. daily. If all plans for refinery expansion now under discussion are carried out, total refining capacity will rise to more than 400,000 bbl. daily, according to estimates made by British Government officials.

Chemical Engineers Hear Wide Range of Subjects Discussed

REFINING, natural-gas processing, hydrocarbon synthesis, petroleum production and reservoirs, and unit operations pertaining to these branches of the oil and gas industry were topics of discussion by some of the nation's top engineers at the regional meeting of the American Institute of Chemical Engineers in Tulsa, May 9-11. This was the first national meeting held by A.I.Ch.E. in the Mid-Continent area.

The six-session, 27-paper program made available to executives, engineers, technicians and other personnel engaged in the chemical field of the petroleum industry, important information on primary energy, engineering economics, and operations. All papers on related subjects were grouped for presentation during a given session in symposium form.

Discussion on "Liquid Fuels for Energy Supply," a paper jointly authored by three Standard Oil Development Co. engineers, brought out the belief that improvement in octane number of motor gasoline is in the direction of conservation when produced to fuel the higher compression ratio engines. Clayton G. Ball, Paul Weir Co., in his paper, "Coal, a Basic Source of Primary Energy," presented some interesting estimates on installation and operating costs necessary to provide solid fuel supply for a synthesis plant.

Specific information on the hydroforming process employed in the operations of the Baytown Ordnance Works was included in the paper, "Production of Aromatics," by C. H. Marshall, Humble Oil & Refining Co.

Members of the research staff of Stanolind Oil & Gas Co., Tulsa laboratory, made available information on typical yields of chemicals for a 7,000-bbl. daily design basis, commercial hydrocarbon-synthesis plant. Distribution of these chemicals, obtained in the production of hydrocarbon liquids from natural gas ranged from low molecular weight, water-soluble materials to high molecular weight, oil-soluble materials.

M. F. Wirges and J. W. Palm, Cities Service Oil Co. (Del.), outlined in the paper, "Production of Chemicals by Oxidation of Natural Gas Hydrocarbons," some of the processing steps employed in operations of their company's Tallant, Okla., plant.

Equations which provide the designer of process plants with figures for determining the attractiveness of a new project, and examples were given in the paper, "Venture Profitability in Economic Balances," by John Happell and R. S. Aires.

The new Hypersorption process was discussed by Ben M. Holt, chemical engineer of the Ralph M. Parson Co. of Los Angeles. Holt told the engineers that the Hypersorption process was more economical, when compared on a common basis, than the conventional oil-absorption method of extracting propane. He said it is more economical to extract 98 per cent of the propane contained in the field gas by an absorption-Hypersorption process, than to recover 80 per cent of the propane by an oil-absorption plant processing 20,000,000 standard cubic feet of gas a day showing a propane recovery of 22,000 gal. a day of propane or "bottle gas." This compares to a plant investment of $1,910,000 for an oil absorption plant processing the same quantity of gas and recovering 17,950 gal. a day of propane.

Two of the Tulsa section officers, Prof. W. L. Nelson, technical editor of The Oil and Gas Journal and faculty member, Tulsa University, left, and L. K. Cecil, with Infilco, Inc., at the Tulsa meeting

Falkner C. Broach, vice president of the National Bank of Tulsa, stated that, "we have and will continue to have a devalued dollar as measured by former standards." He pointed out that war financing in the form of government bonds sold to banks enormously increased the available reserves upon which banks can make loans. Broach emphasized that the increased supply can only be reduced if the Government retires the bonds or they are acquired by non-bank investors.

Most wars have been financed in part through money devaluation of one sort or another and World War II was no exception, he said. It appears likely that the "monetary history of fighting wars may apply likewise, but in a lesser degree, to a cold war."

Combustion energy in the future will be in only two forms, liquids for internal combustion engines and gas for industrial and residential uses, indicated E. Holley Poe in addressing the symposium on primary energy. He predicted that the future might see areas, such as New England, which are distant from sources of natural fuels producing gas from oil and areas such as Texas making gasoline and oil from gas.

In speaking of present markets, Poe made the statement that the growth of the natural-gas pipe-line industry would "continue at an accelerated pace for the next few years until the great market areas are adequately served. A profitable market is waiting in New England that would justify a major pipe line from reserve sources in the Southwest. There appears to be an economic need for a major pipe line into the Pacific Northwest from Alberta or the Rocky Mountain area."

A "Digest Section" containing the A.I.Ch.E. papers appears in this issue, commencing on page 110.

Here at the A.I.Ch.E. registration desk are L. L. Davis, manager of the research and development department, Continental Oil Co., Ponca City, Okla., left, and Frank R. Curtis, vice president, Monsanto Chemical Co., St. Louis, 1949 president of the Institute

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Familiar Noise

WASHINGTON.—Advocates of public power are developing a new argument for the harnessing of our rivers—the possibility that we will run out of petroleum.

The idea was given a trial run last week before the House of Representatives, when Congressman Richard J. Welch of California, urging the development of the American River Basin, declared that at its present rate of production the state's known oil reserve will be exhausted in about 10 years.

Taking the 1947 estimate of the A.P.I. of 21,488,000,000 bbl. of oil reserves and the 1948 production of more than 2,000,000,000 bbl., he pointed out that our national oil reserves, like those of California, will last for approximately 10 years.

A volume of oil equivalent to nearly one-third of last year's production could be saved by the use of hydroelectric power, Welch contended.

"I have learned from the best possible source of information the astounding fact that if the full hydroelectric potentialities of the United States west of the Mississippi River were utilized the amount of power thereby produced would be the equivalent of the amount of electric power that could be obtained by burning 600,000,000 bbl. of oil per year," he said.

The point having thus been raised, it is expected that the question of oil supply will be pressed vigorously in all efforts to carry out the administration's program for all-purpose development of our large river basins.

Peron Has a Plan

REPORTS to Washington from Buenos Aires make it evident that Argentina's economic strategy will be to export her products to European countries, taking oil, coal, and machinery in exchange, while at the same time pushing her export trade with the United States to pay for imports she cannot get elsewhere.

Already, this leaning toward Europe has been evidenced in the switching of Argentine petroleum purchases from the United States to Britain. But Argentine officials realize the impracticability of sending exports to Europe in return for a small quantity of capital goods, such as oil, plus large amounts of consumer and nonessential goods not required in the country, and at the same time build up trade with the United States.

The ideal would be to foster European trade, which can be handled with sterling, while building up exports to this country to a point around $400,000,000 a year (the record top was $185,000,000 in 1948) to secure dollars needed to buy here the machinery and other capital goods which only the United States can supply.

President Peron's tactics in demanding prices far above world markets for Argentina products, however, have hampered this program from getting a real start.

A Draw, Perhaps?

THE most likely way out of the tidelands deadlock in which Congress finds itself appears at the moment to be the proposal made by Congressman John E. Lyle, Jr., of Texas, although Secretary Krug's recent remarks before the National Petroleum Council did not give encouragement to the idea that President Truman would accept it.

Briefly, Lyle proposes a face-saving demarcation of the tidelands, recognizing state ownership to the 3-mile limit in the case of states other than Texas, where a greater distance would support the state's claim to 3 leagues, with federal ownership from that line out; but this would be simply a more or less technical division, since all the revenue from oil operations in both state and federal areas would be split equally between the state and federal governments, and leasing activities would be administered by joint boards.

The Lyle compromise is considered far more attractive to the states than that proposed by Rep. Francis Case of South Dakota, who would give the states a 1-mile belt only and put the rest of the submerged lands in a federal waterlands reserve. It might prove particularly acceptable to the Gulf states, where the bulk of operations, and hence of revenue, may well be far beyond the limits of sovereignty which they now claim, while California might take it as preferable to a fight for quitclaim legislation in which, at the moment, it has less than a 50-50 chance of success.

The most important unknown quantity, however, is the attitude which the President would take if such a plan were actually laid before him. Krug told the NPC that no compromise which involves any modification of the Government's position was feasible. On the other hand, presented with what Congress believes the best way of handling a bad situation, an adamant stand by Truman might create so much resentment that Congress would wash its hands of the whole thing by turning the tidelands back to the states.

Eventually, it may be the Government, and not the states, which is faced with the choice given by Case in his bill—half a loaf or no bread at all.

Where It Went

PROCUREMENT authorizations for petroleum and products amounting to $458,700,000 were approved by the Economic Cooperation Administration during the first year of the European Recovery Program, $159,300,000 representing the domestic oil industry's share of the business, the remainder being divided among Latin America, $141,200,000; the Middle East, $124,000,000; the participating countries themselves, $34,200,000, and Canada, $100,000.

The largest beneficiaries of ECA's petroleum authorizations were the United Kingdom, which got $153,500,000, and France with $133,800,000. Authorizations also were provided to Italy, $43,100,000; Netherlands, $26,400,000; Bizone Germany, $4,400,000; Austria, $1,700,000; Belgium-Luxembourg, $19,600,000; Greece, $11,400,000; Denmark, $23,000,000; French Zone of Germany, $6,000,000; Norway, $11,700,000; Ireland, $6,500,000; Sweden, $17,100,000, and Iceland, $400,000.

The only guide to authorizations for specific petroleum products is to be found in an analysis of the shipments for which ECA paid during the year, which totaled $308,000,000.

Those figures showed the crude oil accounted for $81,900,000 of the total, motor gasoline, $49,500,000; gas and diesel oil, $32,300,000; residual fuel oil, $29,300,000; lubricants and greases, $26,500,000; aviation gasoline, $19,700,000; kerosine, $18,400,000; other products, $13,000,000, and unclassified shipments, $37,400,000.

The records show that only $3,000,000 of the nearly $82,000,000 worth of crude oil was shipped from the United States, $58,000,000 of it moving from the Middle East and $20,200,000 from Latin America. In products, the United States provided all but $100,000 worth of the lubricants and greases, all but $2,700,000 worth of the aviation gasoline, about 40 per cent of the gas and diesel oil, slighly under one-fourth of the motor gasoline, and only $900,000 of the kerosine, and $1,700,000 of the residual fuel oil.

Gas-Line Construction Activity At Highest Point Since 1931

by Paul Reed

NATURAL-GAS pipe-line construction is now being conducted on a larger scale than for any period since the 1930-31 boom. This year the current natural-gas programs in the United States, including approximately 100 miles completed in 1949 plus 6,900 miles of projects now under construction, total 7,000 miles, which is more than 30 per cent higher than domestic lines for this purpose laid in 1948. In addition to these, plans have been announced for 16,500 miles of gas lines in the United States on which work has not started. These, plus 1949 construction just mentioned, total 23,500 miles—currently constructed and contemplated.

Several large projects are being built over periods covering more than a year. Previous construction on Michigan-Wisconsin Pipe Line Co.'s 1,548-mile system from Hansford, County, Texas, for deliveries to Milwaukee and Detroit accounts for about 450 miles. This year work has been contracted for early construction of 710 miles. Completion of the project has been scheduled for July 1, 1950. Cities Service Gas Co. is laying 130 miles of 26-in. this year to complete the 405-mile, 24-26-in. Ulysses, Kans.-Kansas City line started in 1948. Transcontinental Gas Pipe Line Corp. is starting construction this month for 600 miles of 30-in. as the first step toward building the 1,840-mile trunk line from Mercedes, Tex., to 132nd Street, in New York City, which is to be completed in 1951.

El Paso Natural Gas Co. and Pacific Natural Gas Co. are engaged in major pipe-line construction totaling 960 miles of 30-in. and 34-in. for transmitting Permian Basin gas to San Francisco, to be completed in 1950.

In Argentina, Direccion General del Gas del Estado is carrying on construction of an 1,100-mile, 10-in. line from Comodoro Rivadavia to Buenos Aires which was commenced in 1947.

In foreign countries, the 1949 gas-line construction including 150 miles already completed and 1,650 miles under way total 1,800 miles. These added to the 2,900 miles of projects planned for the future give a total of 4,700 miles of gas-line programs abroad.

Domestic and foreign gas-line undertakings included in 1949 and future activity total 28,200 miles.

Principal Domestic Natural-Gas Pipe-Line Projects

Company—	Length (miles)	Diameter (in.)	Status	Contractor, location, and completion date
Alabama-Tennessee Natural Gas Co.	75	10	Planned	From Tenn. Gas Trans. Co. line near Selmer, Tenn., to Tuscombia, Ala.
Alabama-Tennessee Natural Gas Co.	61	6	Planned	Tuscombia to Huntsville, Ala.
Arkansas Louisiana Gas Co.	163	20	Planned	Weskom, Tex., and Perla, Ark.
Atlantic Gulf Gas Co. (United Gas P. L. Co.)	1,530		Planned	Alabama-Florida-Georgia-South Carolina
Atlantic Seaboard Corp. and Virginia Gas Trans. Corp.	268	26	Under way	H. C. Price, Ray L. Smith & Son.—Clendenin, W. Va.-Rockville, Md.
Atomic Energy Commission (United States Government)	95	12	Under way	Morrison-Haddock Engr. Co.—Bloomfield to Los Alamos, N. M.
Central Kentucky Natural Gas Co.	38	12-20	Planned	Kentucky loops, 1949.
Chicago District Pipe Line Co.	41	24	Authorized	Authorized Joliet to Chicago, Ill., 1953.
Cities Service Gas Co.	130	26	Under way	R. H. Fulton & Co.—Newton-Ottawa, Kans.
City of Indianapolis, Inc.	55	16	Proposed	Indianapolis, Ind., to Texas Eastern Transmission Corp. system.
Coast Counties Gas & Electric Co.	40	3-4-8	Under consideration	Coast and Valley region, Calif.
Colorado Interstate Gas Co.	38	20	Planned	Texas Panhandle and Hugoton Field, Kans., to Denver, Colo., looping.
Colorado-Wyoming Gas Co.	41		Planned	Greeley, LaSalle and Windsor, Colo., areas.
Commonwealth Natural Gas Corp.	537	20	Planned	West Bend, Ky., to Norfolk, Va.
Consolidated Gas Utilities	41	12	Under consideration	Enid to Blackwell, Okla., Marlow to Cement, Okla.
Egyptian Natural Gas Co.	80	6-8	Planned	Norris City to Salem-Centralia, Ill., areas.
East Tennessee Natural Gas Co.	398	3-16	Planned	Nashville-Chattanooga-Knoxville, Tenn., and lateral lines.
El Paso Natural Gas Co.	105	24	Authorized	Company crews—Upton County, Tex.-Jal, N. M., 10-49.
El Paso Natural Gas Co.	102	26	Authorized	Company crews—Crossover South to Topock, Ariz.
El Paso Natural Gas Co.	450	30	Under way	Company crews—Eunice, N. M.-Blythe, Calif., looping, 1951.
El Paso Natural Gas Co.	451	24	Planned	Farmington, N. M. (San Juan Basin)-Topock, Ariz. 1951.
El Paso Natural Gas Co.	270		Planned	Laterals for San Juan project.
El Paso Natural Gas Co.	130	6-8-10	Under way	Company crews.—Wilcox-Globe, Ariz.
Gulfcoast Northern Gas Co.	1,184	26	Planned	Corpus Christi, Tex., area to Rockford, Ill.
Home Gas Co.	20	6-10	Under way	Britton Cont.—Dundee Storage Field, N. Y., 6-1-49.
Home Gas Co.	70		Planned	Orange, Sullivan-Rockland Counties, N. Y.-Cattaraugus County, N. Y., areas.
Hope Natural Gas Co.	32	16	Under way	Pipe Line Const. & Drlg. Co.—Hasting to Clarksburg, W. Va., 8-1-49.
Hope Natural Gas Co.	13	14	Under way	Pipe Line Const. & Drlg. Co.—Hasting to South, 7-1-49.
Houston Pipe Line Co.	10	12	Authorized	Houston to San Jacinto Field, Fall.
Houston Pipe Line Co.	67		Under way	Latex.—Village Mill, Tex., area.
Illinois Northern Utilities Co.	9	4	Under way	Midwestern Const.—Oregon, Ill., regulating Station to Nat. Gas Pipe Line Co. of America's meter station.
Interstate Natural Gas Co.	4	8-10	Under way	Krotz Springs, La., area.
Iroquois Gas Corp.	13	22	Planned	Loops, New York State.
Kansas-Nebraska Natural Gas Co., Inc.	210		Planned	Kansas Nebraska areas.
Kansas Light & Power Co.	146	20-22	Under way	M. J. White.—Ulysses to Pratt, Kans.
Lavaca Pipe Line Co.	18	6	Authorized	Continental Const.—Pt. Comfort to Francitas, Tex., wrought iron line.
Lavaca Pipe Line Co.	7	4	Under way	Continental Const.—Matagorda Bay, Tex.
Lone Star Gas Co.	70	20	Under way	Eastern Const.—Opelika to Greenville, Tex.
Manufacturers Light & Heat Co.	5	6	Authorized	Steubenville-Wintersville, Ohio.

Company—	Length (miles)	Diameter (in.)	Status	Contractor, location, and completion date
Manufacturers Light & Heat Co.	86	6-12	Under way	Williams Bros.—Port Jervis-Nyack, N. Y.
Manufacturers Light & Heat Co.	30	6-12	Under way	Britton Const.—Majorsville, Pa., area. 6-1-49.
Manufacturers Light & Heat Co.	12	12-16	Under way	Britton Const.—Cannonsburg, Pa., area. 6-1-49.
Mesabi Pipe Line Co.	400	18	Proposed	Keokuk, Iowa-Itasca, Minn.
McCarty Oil & Gas Co.	100	12-14-16-20	Under way	Anderson Bros.—Jackson Pasture to Orange, Tex.
Michigan Gas Storage Co.	113	20	Under way	Mahoney Const.—Laying 61-mi., Freedona-Laingsburg-Lansing, Mich., area.
Michigan Gas Storage Co.	180	24	Under way	J. R. Horrigan.—Marysville-Grant City, Mo.
Michigan Wisconsin Pipe Line Co.	170	24	Under way	J. R. Horrigan.—Sandwich Jct., Ill.-Mt. Pleasant, Iowa.
Michigan Wisconsin Pipe Line Co.	180	22	Under way	J. R. Horrigan.—Milwaukee-Burlington, Wis.
Michigan Wisconsin Pipe Line Co.	180	22	Under way	Oklahoma Cont.—Big Rapids, Mich.-Crown Point, Ind.
Mississippi River Fuel Corp.	215	24	Planned	R. B. Potashnick.—Northwest Louisiana to Fredericktown, Mo. Looping.
Montana-Dakota Utilities Co.	30	4	Authorized	Saco and Baker lines.
Montana-Dakota Utilities Co.	60	3-4-8-12	Authorized	Field lines for 1948 construction.
Natural Gas Co. of West Virginia	5	8	Authorized	Near Salem, Ohio.
Natural Gas Pipeline Co. of America	27	26	Under way	Midwestern Const.—Main-line looping, Iowa and Illinois.
New York State Natural Gas Co.	45	16	Planned	Rasselas to point near State Line Sta., N. Y.
Northern Natural Gas Co.	58	4-24	Authorized	Hugoton and Panhandle fields.
Northern Natural Gas Co.	135	20-24	Under way	C. G. Griffis Const.-Eastern Const.—Iowa, Minnesota, Kansas, Nebraska.
Northern Natural Gas Co.	88		Planned	Kansas-Nebraska Looping.
Northwest Natural Gas Co.	750		Planned	Washington, Oregon, and Idaho.
Ohio Fuel Gas Co.	88	20	Under way	Midwestern, Anderson Bros.—Crawford-Lick station, Ohio; Lick-South Point stations, Ohio.
Ohio Fuel Gas Co.	48	20	Under way	Mahoney.—Mount Gilead to Treat station; Pavonia station to Washington, Ohio.
Ohio Fuel Gas Co.	8	18	Under way	Anderson Bros.—Centerville, Ohio, to Station 16, Texas Eastern.
Ohio Fuel Gas Co.	85		Planned	Central Ohio replacement.
Oklahoma Natural Gas Co.	65	12	Under way	Trojan Const.—Chandler to Blanchard, Okla.
Pacific Gas & Electric Co.	47	8	Authorized	Salinas to Kilig City, Calif.
Pacific Gas & Electric Co.	510	30-34	Under way	Bechtel-Price-Conyes.—Topock, Ariz.-Milpitas, Calif., 1950.
Panhandle Eastern Pipe Line Co.	188	26	Under way	R. H. Fulton.—Liberal to Emporia, Kans., loops.
Panhandle Eastern Pipe Line Co.	38	26	Under way	C. S. Foreman Co.—LaMine Area, Mo.
Panhandle Eastern Pipe Line Co.	45	26	Under way	Anderson Bros. Corp.—Ft. Wayne, Ind.
Panhandle Eastern Pipe Line Co.	252	26	Authorized	Loops from Texas and Michigan.
Peoples Natural Gas Co.	35	14	Planned	Texas Eastern to P.N.G. east of Pittsburgh.
Piedmont Natrual Gas Corp.	1,290	20	Planned	Upper Gulf Coast area to Danville, Va.
Potomac Gas Co.	18	16	Planned	Dranesville to Arlington, Va.
Rocky Mountain Gas Co.	55	8	Completed	Dawson & Corbett, Pipe Line Welding Co.—Wyoming.
San Diego Gas & Electric Co.	53	16	Planned	San Diego County, Calif. 12-1-49.
Southern California Gas Co.	13	30	Under way	Alex Robertson.—Rivera to Pasadena, Calif., 12-1-49.
Southern Counties Gas Co.	88	30	Planned	Whitewater to Rosemead, Calif. 12-1-49.
Southern Counties Gas Co.	17	30	Planned	Rivera to SW. Los Angeles, 12-1-49.
Southern Counties Gas Co.	35	16	Planned	Moreno to San Diego County, Calif. 12-1-49.
Southern Natural Gas Co.	138	20-22	Planned	Chattanooga, Tenn., to Lexington, Miss.
Southern Natural Gas Co.	375	24	Planned	Gwinville, Miss., to Atlanta, Ga.
Southern Natural Gas Co.	225	16	Planned	Colfax, Ga., extension.
Southern Natural Gas Co.	61	24	Under way	Latex.—Eastern Alabama Loop.
Southern Pipe Line Co.	6	6	Under way	D. D. Pelty.—King Field to Agua Dulce Field, Texas.
Southern Pipe Line Co.	18	6-7-8	Completed	Sheppard-Geiger Const.—Edroy to Saxet, 22 months.
Southern Union Gas Co.	32	10-12-14	Under way	R. H. Fulton, H. B. Zachry, J. W. Walton.—Albuquerque, Santa Fe, Roswell, N. M., loops.
Southern Union Gas Co.	78	8-10-14	Planned	N. M. loops and laterals.
Stanolind Oil & Gas Co.	137	22-4	Under way	Deaton & Sons.—Ulysses, Kans., 4-1-49.
Tennessee Gas Transmission Co.	30	30	Unded way	Morrison.—Sabine River-Pineland, Tex.
Tennessee Gas Transmission Co.	62	24-30	Under way	H. C. Price.—Refugio to Victoria, 8-1-49.
Tennessee Gas Transmission Co.	65	16	Planned	Ohio-Pittsburgh spur.
Tennessee Gas Transmission Co.	790	20-26	Planned	Burnaugh, Ky., to Boston, including 395-mile line to Buffalo, N. Y.
Tennessee Gas Transmission Co.	992	36	Planned	First 150 miles of loops to be laid at Monroe, La.; Greenville, Miss.; Midland and Portland, Tenn.
Tennessee Gas Transmission Co.	47	30	Authorized	Louisiana.
Tennessee Gas Transmission Co.	58	30	Authorized	Mississippi.
Tennessee Gas Transmission Co.	45	30	Authorized	Tennessee.
Texas Eastern Transmission Corp.	18	8	Authorized	Silsbee and Hastings, Tex., areas.
Texas Eastern Transmission Corp.	7	10-12	Authorized	Lincoln Parish, La.
Texas Eastern Transmission Corp.	1,400	26	Planned	Texas to Pittsburgh, Pa., loops.
Texas Eastern Transmission Corp.	122	26	Under way	Associated Pipe Line Contractors.—Lebanon to Somerset, Ohio.
Texas Eastern Transmission Corp.	55	26	Under way	Williams Bros.—Bealville to Woodsfield, Ohio looping.
Texas Eastern Transmission Corp.	69	20	Planned	Looping in Beaumont, Tex., and Castor to Lisbon, La., areas.
Texas Eastern Transmission Corp.	100	16	Planned	Provident City field to Lavaca County to Baytown, Texas.
Texas Gas Transmission Corp.	723	26	Under way	Latex, O. C. Whitaker, J. R. Horrigan, Williams Bros., Midwestern Const.—Lisbon, La., to Middletown, Ohio.
Texas Gas Transmission Corp.	110	20	Under way	N. A. Saigh.—Carthage, Tex., to Lisbon, La.
Texas Gas Transmission Corp.	32		Planned	Madisonville to Evansville, Ind.
Transcontinental Gas Pipe Line Corp.	1,840		Under way	70-mi., 20-in.; 460 mi., 26-in.; 1,210 mi., 30-in. Rio Grande Valley, Tex., to New York City.
Transcontinental Gas Pipe Line Corp.	380	8-16	Planned	Laterals to gas fields.
Trunkline Gas Supply Co.	1,500	22-26	Planned	Edge, Tex., to Palmyra, Nebr.
United Fuel Gas Co	32	20	Authorized	Roane, Calhoun, and Wetzel Counties, W. Va.
United Gas Pipe Line Co.	14	7-8	Under way	Brown & Root.—West Lake Verret to Oaklawn, La.
United Gas Pipe Line Co.	8	8-10	Under way	Wood Eng. & Const.—Panola County, Texas. Connection from Lone Star gasoline plant to United company's Carthage-Longview line.
United Natural Gas Co.	22	22	Authorized	Replacing 12-in. line Elk County, Pa.
United Natural Gas Co.	29	12	Authorized	Laterals, Elk County, Pa.

Company—	Length (miles)	Diameter (in.)	Status	Contractor, location, and completion date
Warren Petroleum Corp.	250	2-4-12-30	Under consideration	P. L. Service, Holland Const., George Davis.—Garvin County, Okla., gathering lines.
Warren Petroleum Corp.	29	2-26	Under way	Holland Const.—Maysville, Okla.
Washington Light Co.	30	6-12	Under way	Britton Contr.—Washington, Pa.
West Texas Gas Co.	14	4-5	Planned	Oilton and Seagraves, Tex., laterals, 2-49.

FOREIGN NATURAL GAS PIPE-LINE PROJECTS

Company—	Length (miles)	Diameter (in.)	Status	Contractor, location, and completion date
Direccion General del Gas del Estado	500		Planned	Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.
Direccion General del Gas del Estado	1,100	10	Under way	Tecnica and government crews.—Comodoro Rivadavia-Buenos Aires, Argentina.
Northwest Natural Gas Co.	600	24	Planned	Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.
Petroleos Mexicanos	150	20	Completed	Williams Bros.—Poza Rica to Mexico City, Mexico.
Petroleos Mexicanos	205	16	Under consideration	Monterrey to Torreon.
Petroleos Mexicanos	260	20	Under consideration	Monterrey-Tampico-Pozo Rica Area
Petroleos Mexicanos, Mexican Gas Co., and Industrial Gas Co.	600		Planned	Reynosa, Tamaulipas to Mexico City.
Regie Autonome des Petroles	114	6	Under way	Toulouse-Bordeaux, France.
U.S.S.R. (reported)	360		Under way	Dashiva (in Carpathians) to Kiev, Ukraine.
Western Pipe Lines	710	22-24	Planned	Alberta fields-Saskatoon, Alta., to Winnipeg, Man., Can.

NSRB Committee to Study Problems Of Pipe Lines in Event of Emergency

WASHINGTON. — Problems which confront the oil and gas pipe lines of the country in the event of a national emergency have been put under study by the National Security Resources Board as part of a general survey of the wartime role and problems of all forms of transportation.

A special pipe-line committee has been set up by Capt. Granville Conway, director of the board's office of transportation and storage, with Bruce C. Clardy, Standard Oil Co. (Ind.), as chairman and a membership drawn from the oil and gas industries and the military establishment, departments of Agriculture, Commerce and Interior, Interstate Commerce Commission, and Federal Power Commission.

The general problem, Clardy explained, is to determine the plan of control under which the highest efficiency would be obtained in the event of an emergency. The committee, he said, will review the World War II experience of pipe-line carriers as affecting current and future conditions, and will study the roles of gas pipe lines in the case of necessity.

Industry members of the committee include: W. C. Kinsolving, Sun Pipe Line Co.; J. L. Burke, Stanolind Pipe Line Co.; S. H. Elliott, Sohio Pipe Line Co.; H. B. Pressler, Humble Pipe Line Co.; Loren F. Kahle, Interstate Oil Pipe Line Co.; Charles I. Thompson, Ballard, Spahr, Andrews & Ingersoll; Gordon Locke, Committee for Pipe Line Companies; J. H. Russell, Gulf Oil Corp.; Harry Morland, Great Lakes Pipe Line Co.; T. E. Swigart, Shell Pipe Line Co.; W. R. Finney, Standard Oil Co. (N.J.); A. M. Gee, Ohio Oil Co.; J. W. Emison, Texas Pipe Line Co.; L. H. True, Magnolia Pipe Line Co.; James J. Cosgrove, Continental Pipe Line Co.; Clyde Swigart, Standard Oil Co. of California; N. C. McGowan, United Gas Pipe Line Co.; R. H. Hargrove, Texas Eastern Transmission Corp.; Bruce McCully, Cooperative Refining Association; George S. Young, Columbia Gas Systems, Inc.; Paul Kayser, El Paso Natural Gas Co., and Edward Buddruss, Panhandle Eastern Pipe Line Co. Robert W. Shields of the Interstate Commerce Commission will serve as secretary.

Gasoline Increase Not Enough, Jennings Says

NEW YORK. — Reductions in the price of fuel oils far outweigh the recent 1-cent increase in gasoline, and as a result, refinery realization of Socony-Vacuum Oil Co., Inc. has dropped 27 cents a barrel since last November, according to B. Brewster Jennings, president.

Jennings over the weekend replied to a telegram from Gov. Kerr Scott, North Carolina, asking an explanation of the motor-fuel price increase.

Even after the increase in gasoline, "the most efficient refineries operating east of the Rockies probably can do no better than break even, while many of them may even operate at a loss," Jennings said. Since the middle of last November, Jennings told the governor, residual fuel prices of the company have dropped about 2.88 cents, heating oils 1.625 cents, and kerosine 1 cent. Jennings said yields were: 41 per cent gasoline, 7 per cent kerosine, 23 per cent heating oils and other distillates, and 21 per cent residual.

The Socony-Vacuum president also told Scott that motor-fuel demand, now about 9 per cent above a year ago, continues strong and that the company is unable to buy gasoline from other Gulf Coast refiners at prices equal to the published lows.

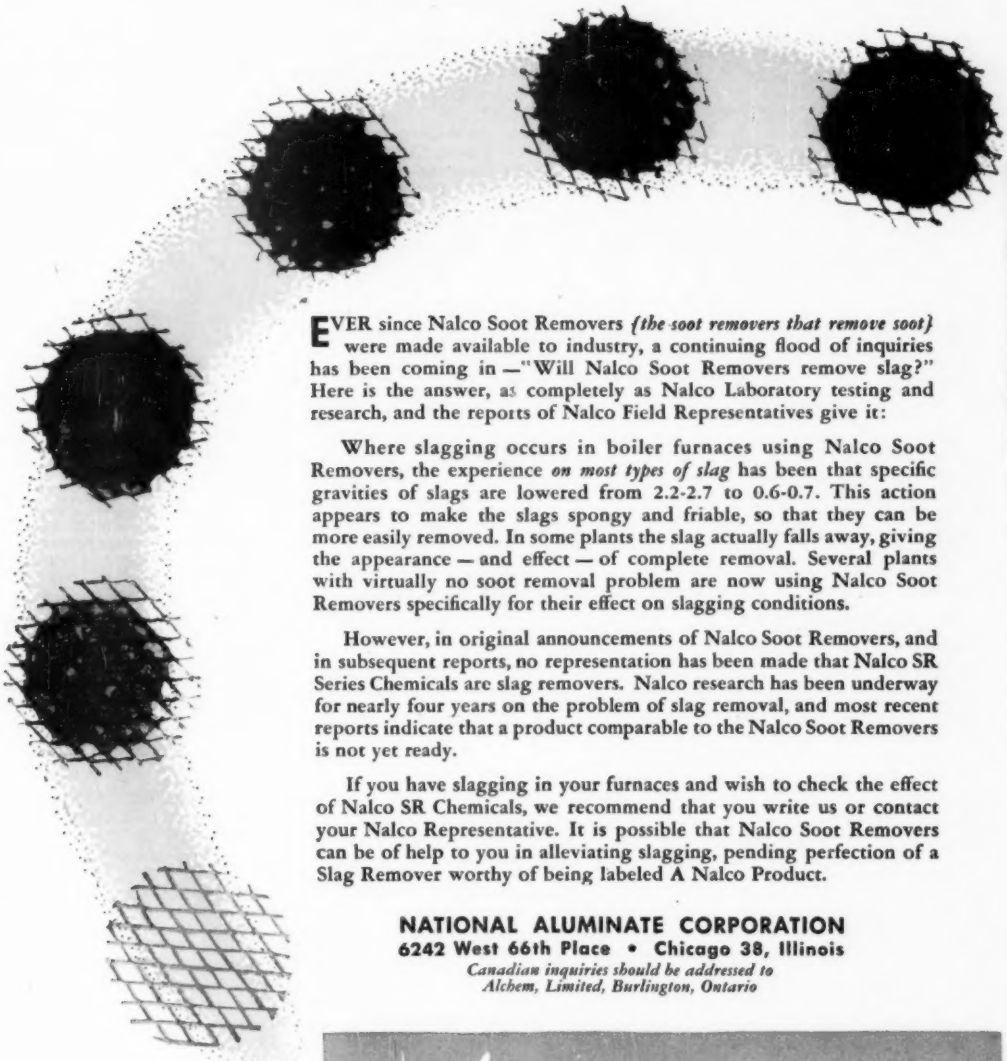
Answering the governor's question as to whether jobbers and dealers had benefited from the gasoline increase, Jennings explained that the company does not control their selling prices. The governor had asked also why the company followed immediately the lead of Esso Standard Oil Co. in making the gasoline increase. Jennings said the necessity of this adjustment had been recognized earlier, but because of Socony-Vacuum's small volume in the area, it was necessary to wait until more substantial sellers recognized the same factors and took action.

Research Given 15 Per Cent of 1948 Oil Dollar

NEW ORLEANS.—During 1948 the oil industry invested more than 15 per cent of its over-all national expenditures in industrial research, Dr. Harold Gershinowitz, director of exploration and production research for Shell Oil Co., Inc., told the group attending the annual banquet of the New Orleans Academy of Science last week at Tulane University.

The group heard a symposium on science and engineering in the oil industry. Speakers included Donald D. Utterback, district geologist for Houston Oil Co.; James H. Todd, chief geophysicist, The California Co.; Allen M. Peairs, refinery manager of Gilcrease Oil & Refining Co.; and James C. Posgate, division petroleum engineer for Humble Oil & Refining Co.

DO *Nalco* SOOT REMOVERS REMOVE **SLAG?**



EVER since Nalco Soot Removers *{the soot removers that remove soot}* were made available to industry, a continuing flood of inquiries has been coming in—"Will Nalco Soot Removers remove slag?" Here is the answer, as completely as Nalco Laboratory testing and research, and the reports of Nalco Field Representatives give it:

Where slagging occurs in boiler furnaces using Nalco Soot Removers, the experience *on most types of slag* has been that specific gravities of slags are lowered from 2.2-2.7 to 0.6-0.7. This action appears to make the slags spongy and friable, so that they can be more easily removed. In some plants the slag actually falls away, giving the appearance — and effect — of complete removal. Several plants with virtually no soot removal problem are now using Nalco Soot Removers specifically for their effect on slagging conditions.

However, in original announcements of Nalco Soot Removers, and in subsequent reports, no representation has been made that Nalco SR Series Chemicals are slag removers. Nalco research has been underway for nearly four years on the problem of slag removal, and most recent reports indicate that a product comparable to the Nalco Soot Removers is not yet ready.

If you have slagging in your furnaces and wish to check the effect of Nalco SR Chemicals, we recommend that you write us or contact your Nalco Representative. It is possible that Nalco Soot Removers can be of help to you in alleviating slagging, pending perfection of a Slag Remover worthy of being labeled A Nalco Product.

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Crude Price May Be Expected To Follow Other Commodities

by Charles J. Deegan

CURRENT speculation over the possibility of a decline in the price of crude oil should not overlook the historic relationship between the crude price and the index of all wholesale commodity prices.

For, as the chart in Fig. 1 shows clearly, over the long run the two always have followed the same trends up or down.

There are good reasons to assume that this relationship will continue in the future, though the two lines may not necessarily keep in exact parallel. The crude-oil price is, of course, one of many elements in the general commodity index, which is a weighted average of scores of prices, many of which may fluctuate with relation to each other without changing the general index appreciably. So there is no inexorable force requiring the crude price to follow the general average. But there is a strong presumption that it will do so in the long run.

Another factor is the conditions of supply, demand, and production cost affecting crude prices (or any other component of the index) which at any given time might be different from the conditions affecting other commodities.

Price Supports Weakening

However, it seems obvious that the factors which have held up the price of crude are now softening. It is no secret that refiners' gross income per barrel of crude refined has gone down substantially. Some price cuts already have been made on crudes here and there. Premiums have disappeared. Heavy crudes with high fuel-oil yields are certainly not in favor with refiners—not at present fuel-oil prices. Obviously, Pennsylvania Grade crude, with its high lube content, was out of line with yields from refined lube-oil prices.

Assuming that crude prices will follow the general commodity index, the prime question is what is going to happen to other prices? The Government's economic experts have been putting out mostly double talk which amounts to saying that prices will stay up if they don't go down. Some of the smartest men in business and financial circles frankly say they don't know what to predict.

As a basis for independent judgment, the chart in Fig. 2 shows the situation to date. It gives the trend of all commodity prices and also crude prices by months during 1948 and by weeks during 1949.

It will be noted that in spite of all the talk about falling prices, the general price level of all commodities really has dropped off only a little bit. From a peak of about 210 last summer it fell off to around 195.6 at the middle of April. That is only 14 points, or a shade under 7 per cent, so the talk about big price reductions is exaggerated.

Affected by Controls

One interesting thing which Fig. 1 reveals, and which might have some bearing on the tendency of the price of crude to follow the general index downward, is the effect of artificial price control during the war.

This chart shows the price of crude oil compared with the Bureau of Labor statistics wholesale commodity index over a period of 36 years. This comparison is based on the average price of all commodities for the 5-year period 1935-39 as 100, or par. During this 5-year period the average price of 36°-gravity Mid-Continent crude was $1.101 per barrel.

What happened during the two world wars and during the depression is very plain in this chart. It also shows visibly what the Office of Price Administration did to the oil producer during World War II.

TABLE 1—WARTIME PRICE CONTROL EFFECT ON CRUDE OIL VS. EFFECT ON ALL COMMODITIES. ALSO POSTWAR TREND OF CRUDE-OIL PRICE VS. ALL COMMODITIES

Year—	Crude price index	All commodity price index	Actual crude price	Parity crude price	Difference	Bbl. crude produced (thousands)	Loss of total income-crude producers (thousands of dollars)
1941	101.8	106.4	$1.12	$1.19	$0.07	1,402,228	$98,156
1942	106.4	122.6	1.17	1.35	0.18	1,386,645	249,596
1943	106.4	128.0	1.17	1.41	0.24	1,503,613	360,867
1944	106.4	129.1	1.17	1.42	0.25	1,677,764	419,441
1945	106.4	131.4	1.17	1.45	0.28	1,711,103	479,109
1946	124.5	150.1	1.37	1.65	0.28	1,733,939	485,503
Subtotal						9,415,292	$2,092,672
1947	172.5	188.8	$1.90	$2.08	$.018	1,856,107	334,099
1948	233.4	204.8	2.57	2.25	—0.32	2,051,433	—656,459
1949*	233.4	197.6	2.57	2.18	—0.39	482,367	—188,123
Total						13,805,199	$1,582,189

*First 3 months.

Price control penalized the crude-oil producer more than 2 billion dollars by preventing crude prices from following the general commodity index. How this is calculated is shown in Table 1. As a result of artificial price controls there were 7 years in which the price of crude was below par in relationship to prices of other commodities. An individual producer can tell exactly how much OPA control cost him by multiplying his net production in barrels by 7 cents in 1941, 18 cents in 1942, 24 cents in 1943, 25 cents in 1944, 28 cents in 1945, and 28 cents in 1946.

During 1947, despite the lifting of legal price controls, increases in the price of crude oil, starting from such a depressed level, did not come back

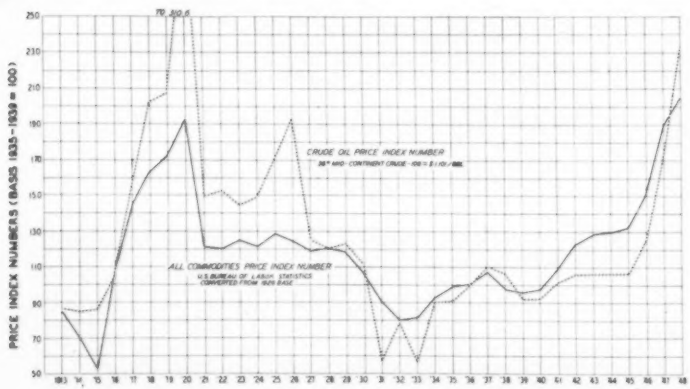
PRICE INDEX NUMBERS (BASIS 1935-1939 = 100)
CRUDE OIL PRICE INDEX NUMBER
ALL COMMODITIES PRICE INDEX NUMBER
U.S. BUREAU OF LABOR STATISTICS

Fig. 1—Comparison of crude-oil prices with average of all commodities since 1913

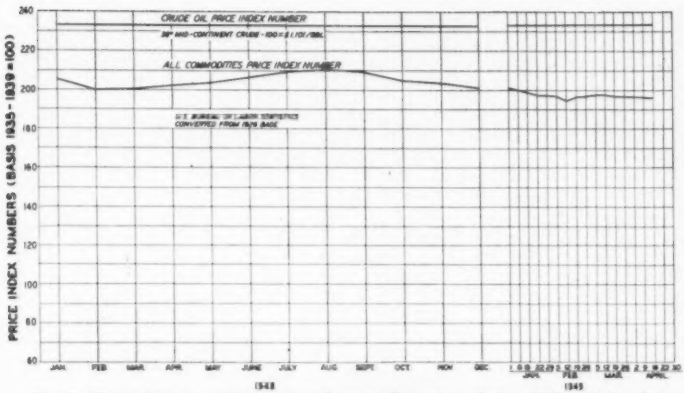

Fig. 2—Comparison of crude prices and commodity prices during 1948 and the first 4 months of 1949

fast enough to overtake the soaring other commodities until December. Although the 50-cent increase finally brought crude prices above other commodities, the average price for the year was 18 cents per barrel below parity. In 1948, for the first time since the beginning of World War II, crude prices were above parity with other commodities, averaging 32 cents per barrel higher.

Losses Being Regained

From 1941 through 1947 the crude-oil producer suffered a total net loss of $2,426,771,000, as compared with what he would have received if his crude price had been maintained at parity with all other commodities. During 1948 the producers got part of this back. At a price of 32 cents per barrel above parity with other commodities, they regained $656,459,000. That reduced the previous deficit, so that as of January 1, 1949, the producers were only $1,770,312,000 in the red on a parity basis.

During the first 3 months of 1949, due to a slight drop in the price index for all other commodities and a stationary crude-oil price, the producers stepped up their margin over parity to 39 cents per barrel. During these 3 months the producers as a whole regained an additional $188,123,000, leaving their accumulated deficit from the price-control period at $1,582,189,000 at the end of the first quarter of 1949.

This deficit is based, of course, on the assumption that crude prices would have paralleled the commodity index if it had not been for OPA regulation.

The general belief, borne out by the historical evidence of Fig. 1, is that if the commodity index takes a sharp and continued drop, the price of crude will follow.

This will not be totally bad, for there would be some compensations. A lower wholesale index would mean reductions in many items of producers' expenses. It is true that wage rates probably will not go down with the wholesale price index, and also that during the postwar years there have been high-cost capital investments which will have a high amortization charge per barrel of crude produced.

But this factor of lower costs may be of some consolation when pondering the prospect that crude prices may drop with the general commodity index.

School Bill Excluding Coastal States Killed

WASHINGTON. — The Senate last week defeated an attempt by Sen. William Langer of North Dakota to withhold federal funds for the aid of education from the tidelands-oil states.

Langer predicated his move on a simple basis — that the question is whether a few states are ultimately going to receive billions of dollars from tidelands oil to aid their school children while the inland states, including North Dakota, "are going to receive none of that money."

An amendment to the legislation which would require a federal audit of expenditures of funds in each state under the act, offered by Langer, was rejected by the Senate without formal vote after he had made a lengthy speech attacking the position taken by Texas and Louisiana against the Government's efforts to take over their tidelands.

Langer quoted at length from testimony given before congressional committee last Congress when quitclaim legislation was under consideration, by Walter S. Hallanan, president of Plymouth Oil Co. and chairman of the National Petroleum Council, who later was strongly defended by Sen. Matthew M. Neely of West Virginia, Hallanan's political opponent for 30 years.

The North Dakota senator also drew the fire of Sen. Russell B. Long of Louisiana for his assertions that the federal Government would be deprived of $26,500,000,000 from "one field" off the coast of Texas and Louisiana. Long pointed out that no such field has been discovered, that the 10,000,000,000 bbl. of oil on which Langer based his argument was merely an estimate of what might be found off the coast of the two states, that the cost of developing anywhere up to 50 miles or more offshore will be terrific with about one chance in 16 of getting any oil, and that, anyway, the Government wouldn't lose any $26,000,000,000, but at most, if its claim to ownership is not upheld, the $3,000,000,000 in royalties which would accrue if, in fact, 10,000,000,000 bbl. of oil was found.

Next Week

Annual Gulf Coast Issue

Featured in this large May 19 edition will be engineering and operating articles and vital statistics on one of the world's most important oil centers. Many outstanding operators and engineers in the Gulf Coast area have contributed special articles dealing with the latest developments in exploration, drilling, production, cycling, natural-gasoline manufacture, refining, and pipe-line transportation.

The scope of the coverage includes the wide belt of oil and gas activities extending throughout the southern portions of Florida, Alabama, Mississippi, Louisiana, and on southwestward through the Texas oil centers of Beaumont-Port Arthur, Houston, Corpus Christi, and down through the Rio Grande Valley to the Mexican border.

Journal editors have prepared special reports on construction and building activities as regards gas-processing plants, refineries, and new pipe-line systems. Other editors have been "to sea" to detail the expansion in exploration and drilling offshore in the Gulf of Mexico, and the same efforts have been made to include important "inshore" developments. All in all, the issue will hit a new high for this annual Gulf Coast reference number of The Oil and Gas Journal.

PERSONALS

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Stewart Well Qualified As Imperial President

RECENT election of George L. Stewart as president of Imperial Oil, Ltd., enables the former chairman of the board of directors to fill a position for which he is well qualified due to his wide experience in all phases of the oil industry.

Born in Winnipeg, Stewart graduated from McGill University in Montreal in 1914 with a B.S. degree in mechanical engineering. His career in the oil business began in 1916 when he joined Imperial's engineering department at Sarnia.

After 2 years in engineering work Stewart was transferred to Halifax, where he became mechanical superintendent in that area. In 1919 he was transferred to the company's manufacturing department at Toronto and after 3 years was moved to Regina, where he became assistant superintendent. In 1923 he was transferred to Sarnia in the same capacity and in 1931 was made superintendent of Imperial's Sarnia refinery. In 1934 Stewart was named general manager in charge of all refineries, with headquarters in Toronto.

Elected a vice president and director of Imperial in 1944, he was in charge of the company's manufacturing operations. He was named chairman of the board of directors in April 1947.

Stewart succeeds H. H. Hewetson, who takes the post of chairman of the board.

Lamar Strickland, former engineer for Chicago Corp. and for the Texas Railroad Commission, Oil and Gas Division, has moved to San Angelo, Tex., as engineer for **George W. Strake,** Houston, independent oil man.

Warren Haun has been granted leave of absence as petroleum engineer for Lion Oil Co. in Schuler field, El Dorado, Ark., to serve as petroleum engineer for Guasare Oil Co. in Western Venezuela. Lion has a third interest in the Guasare company.

George S. Young, who joined Columbia Gas System, Inc., in 1930 as an engineer and who has been in charge of operations for the system since 1946, has been elected a vice president. He was made vice president of Columbia Engineering Corp. in 1942 and a director in 1945.

Harvey M. Lytel, engineer in the production department of Socony-Vacuum Oil Co. of Colombia, has been transferred to Socony-Vacuum Oil Co. of Venezuela in Venezuela.

R. L. Boggs, who has been associated with Mene Grande Oil Co. in various executive capacities the last 21 years, has been elected vice president and director of the company. He joined the Gulf organization in 1927 and went to Venezuela as a petroleum engineer in 1928. As vice president and director, he succeeds **Hoyt Sherman,** who on May 1 become president of Mene Grande. **Chester M. Crebbs,** former Mene Grande president, retired on that date after 31 years' service with the Gulf companies.

Jefferson W. Mitchell, Kansas City, Mo., has been named general manager of National Cooperative Refinery Association, McPherson, Kans., succeeding the late E. J. Mary. Mitchell served as advisor on petroleum matters to the Chinese National Government for 3 years, and was manager of Phillips Petroleum Co.'s Kansas City, Mo., refinery from 1928 to 1940.

Ed Voice, manager of the Midland, Tex., district office of the liquefied petroleum division of Warren Petroleum Corp., has been transferred to the company's headquarters in Tulsa to replace **Jack T. Bradley,** who was recently named manager of a new district office in Madison, Wis. **Richard Brewer,** formerly in the Houston office, has been assigned to the Midland office, and **John F. Donovan** has been transferred from Tulsa to Houston to succeed Brewer. **T. C. Birch** of the Tulsa office has been moved temporarily to Houston.

R. T. Haslam, a vice president and director of Standard Oil Co. (N. J.), and **P. T. Lamont,** world-wide marketing coordinator, returned to New York recently from an extended trip to Latin America during which they visited Brazil, Argentina, Uruguay, and Chile.

Roy M. Ferris, Ronald Ware, and **Jack Humble,** engineers in the Magnolia Petroleum Co. refinery at Beaumont, were elected president, secretary, and program chairman, respectively, at the initial meeting of the Sabine-Neches area chapter of the American Society of Mechanical Engineers.

John S. Russell has been appointed production foreman of the Vanderbilt, Tex., producing district of Magnolia Petroleum Co. He formerly was district petroleum engineer. **W. A. Daniel,** petroleum engineer assigned to Magnolia's Lake Charles, La., district, was to succeed Russell as district engineer in the Vanderbilt district May 1.

J. Sayles Leach, vice president of The Texas Co. since 1938, has been elected a director of the company. He is in charge of the firm's Houston office.

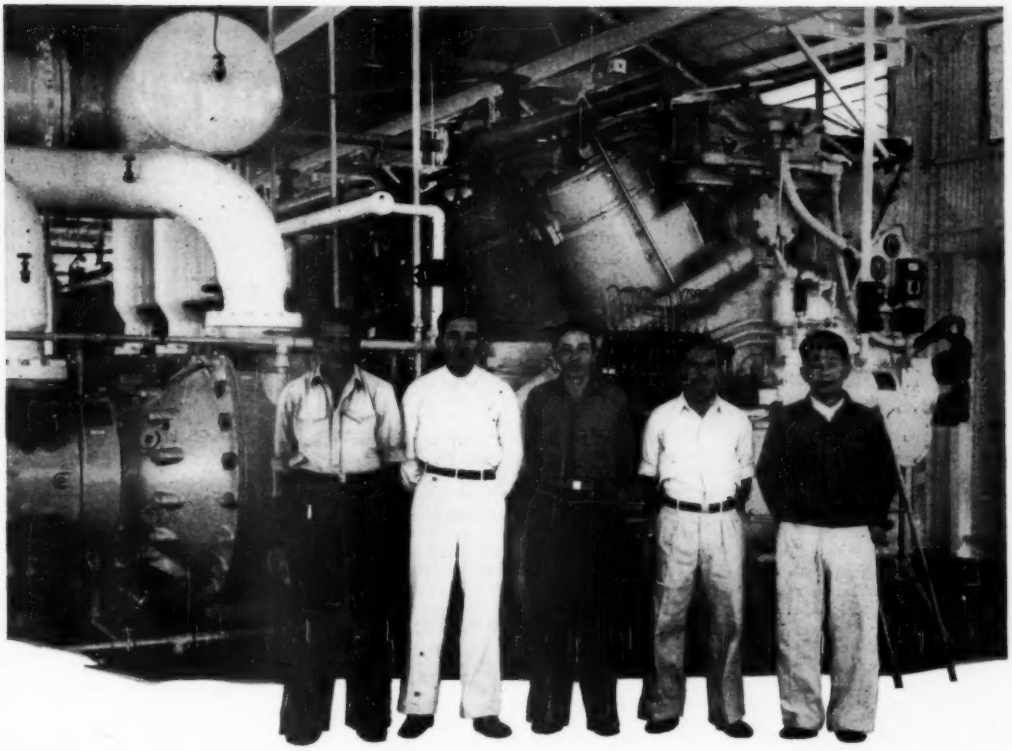
Robert G. Hill has been promoted from assistant field foreman for Texas Petroleum Co. at Tucupita to the position of administrative assistant to the district superintendent at Las Mercedes.

Rouse Simmons, president of Republic Petroleum Co., has announced removal of the company's main office to Artesia, N. M. **R. H. Heard,** vice president, will continue to direct New Mexico operations of the company.

A. L. Hill, formerly field engineer in the natural-gas department of Pacific Gas & Electric Co., has resigned to join the staff of El Paso Natural Gas Co., in Houston.

Guy F. Willey has been named technical assistant to **George H. McKay,** head of oil-movement and storage division of Esso Standard Oil Co.'s Bayway, N. J., refinery. He replaces **John E. Hughey,** who was promoted to technical assistant to the process superintendent.

Dr. Luis Herrera has been promoted from executive assistant to assistant to the president of Mene Grande Oil Co. Prior to joining Mene Grande in 1946 Dr. Herrera was inspector gen-



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eral de hidrocarburos and later director of the Oficina Tecnica de Hidrocarburos of the Ministry of Fomento.

Donald N. McCord, formerly superintendent and project manager for Stone & Webster Engineering Corp. in charge of the construction of the $21,000,000 Shamrock Hotel at Houston, has been engaged by the Glenn H. McCarthy Interests to supervise plant and construction operations. McCord supervised construction of many wartime projects, including the chemical building at Oak Ridge, Tenn., and the laboratory and process building for the atomic bomb.

C. N. Valerius, district exploration manager for Barnsdall Oil Co., is resigning his position effective June 1 to become an independent consulting geologist for the Ark-La-Tex area.

Roger Ogden, an employe of Barnsdall Oil Co. since graduation from the Colorado School of Mines in 1946, has been named district geologist for the company.

W. W. Harris has been named to direct over-all administration of work of all zone supervisors at Baytown, Tex., refinery of Humble Oil & Refining Co. **Paul John** will be in charge of all maintenance and construction foremen, and **John G. Traxler** has been given the responsibility of the over-all administration of the coordination and planning section of the maintenance and construction department.

William H. Morris has been named to succeed temporarily **D. R. Welch,** superintendent of communications for the pipe-line department of Sinclair Refining Co. at Independence, Kans., who has retired. Morris previously served as Welch's assistant.

Charles P. Williams is now general manager of Williams Brothers Co. operations in Venezuela, with headquarters at Edificio Phelps in Caracas, and **Marvin Jones** is now field superintendent. **George Allen** is field superintendent in Bolivia, with **Edward Melanson** serving as office manager, and **Ward Stalnaker** is superintendent of pump-station construction.

Kenneth A. McDaniel, foreman of pipe and coking stills in the Standard Oil Co. (Ohio) refinery at Lima, Ohio, has been named assistant process superintendent. **Harry R. Baxter** has been promoted from plant-unit foreman to assistant process superintendent, and **Michael A. Pappas** has been named new assistant maintenance superintendent. Other promotions at the refinery include: **John D. Stubbs,** from supervisor of the design section of the technical-service division to chief process engineer; **George G. Knepp,** from senior process engineer, technical-service division, to technical assistant; **Robert K. Jewell,** from senior engineer to safety engineer; and **Henry W. Manley,** from engineer to process foreman.

W. T. Holliday, chairman of the board of directors, Standard Oil Co. (Ohio), has been named winner of the 1948 World Government News Award, "for outstanding service to the cause of world federation." Holliday, first choice in the final balloting for the award in the "individual" category, was honored for his treatise on "Our Number One Job: World Peace."

John J. Stanko has been appointed manager of the processing asphalt division of Douglas Oil Co. of California, Los Angeles. He spent 15 years in development of asphalt products and formerly was director of research for Flintkote Co., in New York City.

W. H. Roach, now associated with Carthage Hydrocol, Inc., has been named chemist of the new synthetics plant for converting natural gas to liquid hydrocarbons, now under construction at Brownsville, Tex. He was formerly assistant chief chemist for The Texas Co. at the Lockport, Ill., works.

Bart Gillespie has been appointed general manager of the Mexican Independent Oil Co., with headquarters in Mexico City, and will take up his duties there within 30 days. **Ralph Coleman** has been designated as assistant general manager of the company. Gillespie formerly directed activities of Navy Seabees for oil exploration in the Naval Reserve No. 4, in Alaska. Coleman is a former petroleum engineer for Gulf Oil Corp.

A. N. Horne, vice president, Texas-Empire Pipe Line Co., has been placed in charge of the field office at Decatur, Ill., during construction of the company's Patoka-Wilmington, Ill., crude-oil pipe line. He continues to have his main headquarters at the company's Tulsa office.

F. C. Barclay, formerly manager of the crude-oil purchasing department of Central Pipe Line Co., Salem, Ill., has resigned to form Barclay Oil Co., in Illinois, and Barclay Indiana Oil Co.

Officials of Sinclair Refining Co. and Sinclair affiliates are shown during an inspection of company properties in the Houston area. Left to right: E. J. Haubold, area manager for Southeast Texas; Dave Young, Houston refinery superintendent; F. J. Felice, Houston area manager; H. L. Phillips, president of Sinclair Refining Co. and Sinclair Oil Corp.; E. D. Pipes, area manager of San Antonio; E. Z. Hannon, manager of the land department; E. R. Woods, president of Consolidated Insurance Co.; J. F. Lillie, area manager of Waco, Tex.; R. C. DeWald, area manager in the Rio Grande Valley; and J. Brown, manager of Sinclair Rubber Co. The company now has under way a $150,000,000 expansion program

John L. Copeland has been named superintendent of the Magnolia, Ark., district of Interstate Oil Pipe Line Co., succeeding the late T. F. Welsh. Copeland was assistant superintendent in Mississippi from 1945 to 1948.

S. P. KING

S. P. King, Vermilion, Alta., Canada, has been appointed resident manager of Franco Oils, Ltd. After graduation from University of Southern California in 1941, King spent 7 years in South America as production engineer for Trinidad Leaseholds, Ltd., production superintendent for Trinidad Consolidated Oilfields, and as district petroleum engineer for Creole Petroleum Corp.

Henderson Supplee, Jr., director and vice president of Atlantic Refining Co., was elected to the newly created office of executive vice president at the company's annual meeting May 3. Succeeding him as vice president is **Dwight T. Colley.** Colley and **P. G. Wharton** were named new directors, increasing the board from 9 to 11, and **Hugh W. Field,** a director and manager of research and development, was elected to the office of vice president.

Kenneth H. Crandall, vice chairman of the board of The California Co. and Standard Oil Co. of Texas, has been transferred from New Orleans to the headquarters of the parent, Standard Oil Co. of California in San Francisco. He will supervise the operations of the geological and geophysical departments of these two companies and also of California Standard Co., which operates in Canada, and of Richmond Exploration Co., which operates in Venezuela. In his new capacity Crandall will be assistant to **Gege Lund,** chairman of the board of all four companies, and will remain vice chairman of the two subsidiaries.

Foreign guests attending the April meeting of the Los Angeles chapter of Nomads included **C. H. Vincent,** British Malayan Petroleum Co.; **W. D. Spicer, H. D. Huskey, A. L. Owen,** and **Charles H. Looper,** Iraq Petroleum Co., Ltd.; **S. P. Duffield,** Thornbury Drilling Co.; **D. W. Patton,** Texas Petroleum Co.; **Milton O. Smith** and **T. E. Patton,** Arabian-American Oil Co.; **M. R. Teague,** Standard Oil Co. (N. J.), Egypt; **S. Lac,** Sinclair Petroleum Co.; **Vladimir Ziloff,** French Petroleum Institute; **James Worsdall,** Williams Brothers Corp.; **Donald E. Smith,** Kern Trinidad Oil Co.; **G. B. Garberry,** Brown Drilling Co.; **C. D. Hendershott,** Bahrein Petroleum Co.; and **R. A. Drueke,** Mene Grande Oil Co.

Robert G. Hill, assistant field foreman for Texas Petroleum Co. at Tucupita, has been promoted to administrative assistant to the district superintendent at Las Mercedes, Venezuela.

Julio V. Canessa, Buenos Aires, has been appointed president of Yacimientos Petroliferos Fiscales, Argentina's government oil agency. He formerly was general manager of the government gas company.

F. A. Brownie, Calgary, Alta., Canada, executive assistant to the president of Canadian Western Natural Gas Co., Ltd., has been appointed president of Canadian Western & Northwestern Utilities.

Thurman Pinkerton, petroleum engineer with Magnolia Petroleum Co. at Falfurrias, Tex., was transferred May 1 to the Houston division office.

SHIFTS—

William P. Schultz, engineer, Humble Oil & Refining Co., Avoca, Tex., to Houston; **E. F. Jernigan,** engineer, Warren Petroleum Corp., Hawkins, Tex., to Maysville, Okla.; **F. J. Martin,** foreman, Pure Oil Co., Nederland to Port Neches, Tex.; **R. K. Trach,** superintendent, Humble Oil & Refining Co., Beaumont to Dickinson, Tex.; **John W. Lord,** engineer, Stanolind Oil & Gas Co., Bishop to High Island, Tex.; **Charles Hornberger,** geologist, Sun Oil Co., Corpus Christi to San Antonio; **William Ramsay Gray,** geologist, Sun Oil Co., Dallas to San Antonio.

Otto K. Wetzel, Jr., engineer, Magnolia Petroleum Co., Edna to Dallas, Tex.; **G. H. Card,** superintendent, Stanolind Oil & Gas Co., Fort Worth to Tulsa; **Bill R. Payne,** geologist, Humble Oil & Refining Co., Houston to Genoa, Tex.; **E. H. Gibbons,** superintendent, Sinclair Wyoming Oil Co., Great Bend to Chase, Kans.; **F. L. Wootan,** foreman, The Texas Co., San Antonio to Westville, N. J.; **J. C. McDuffie, Jr.,** engineer, Humble Oil & Refining Co., Tyler, Tex., to Houston; **F. A. Coyle,** superintendent, Earl Callaway Drilling Co., Plain Dealing, La., to Marshall, Tex.; **Vaughn A. Knight,** superintendent, Barnsdall Oil Co., Jennings, La., to Snyder, Tex.

H. V. Copeland, Jr., geologist, Magnolia Petroleum Co., Lake Charles, La., to Lamesa, Tex.; **Ivy Coady,** superintendent, Roy Guffey Drilling Co., Ardmore, Okla., to Gainesville, Tex.; **Jean W. Heim,** geologist, Stanolind Oil & Gas Co., Tulsa, Okla., to Casper, Wyo.; **Donald Nelson,** foreman, Standard Oil Co. of California, Taft to Coalinga, Calif.; **J. R. Patterson,** engineer, Shell Oil Co., Inc., Eagle Lake, Tex., to Houston; **E. L. Walling,** engineer, Humble Oil & Refining Co., Wink to Colorado City, Tex.; **C. E. Siberts,** geologist, Kingwood Oil Co., Jackson, Miss., to Evansville, Ind.; **R. H. Whitney,** geologist, Geological Service, Inc., Oklahoma City, Okla., to Memphis.

DEATHS

Frank A. Willison, business associate for 25 years of the late J. C. Trees, pioneer oil operator, died May 5 in Pittsburgh. Willison, coexecutor of the Trees estate, also was a director of Arkansas Natural Gas Co. and Eastern Ohio Development Co.

G. W. Jarvis, 42, chief engineer, refining department, McColl-Frontenac Oil Co., Ltd., died in Montreal, Que., Canada, recently.

Cade L. Pickering, 40, veteran of 16 years of service with Esso Standard Oil Co. at the Baton Rouge refinery, died in Baton Rouge recently.

O. J. Richardson, 58, Electra, Tex., independent oil operator, died in Electra May 4.

James B. Huff, Jr., 56, independent oil operator of Houston, died May 2 in Houston. Prior to becoming an independent operator Huff had been assistant secretary-treasurer of United Gas Co.

J. W. Culbertson, 74, Wichita Falls, Tex., who was active in development of Petrolia gas field, died in Wichita Falls May 5.

Walter Wilson Connell, 56, Fort Worth, independent oil operator, died in Fort Worth May 1.

J. Bartley Milam, 65, Claremore, Okla., pioneer Oklahoma oil operator, died in Kansas City, Mo., May 8. He was in partnership with Woodley G. Phillips.

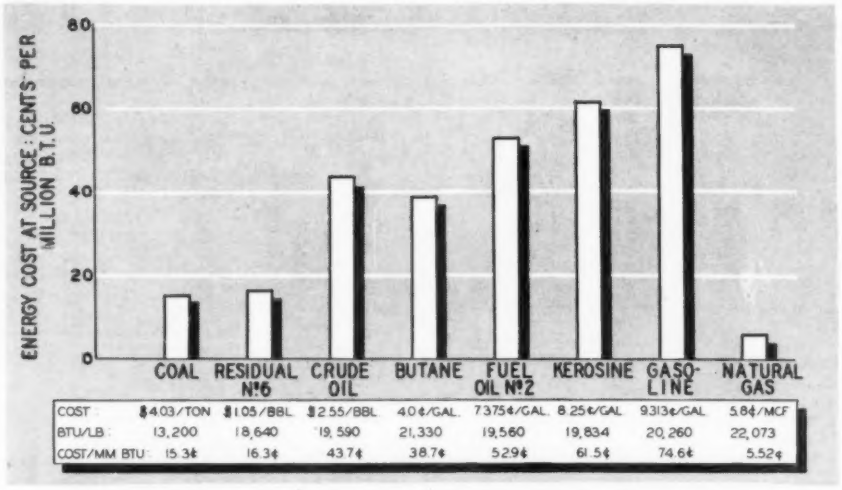

Fig. 1—Comparative fuel-source costs per 1,000,000 B.t.u. energy content (April 4, 1949, Mid-Continent costs on crude oil and refined products; January 1, 1949, U. S. costs on coal and natural gas)

ENERGY BASIS COMPARISON OF FUEL-SOURCE COSTS

by Thomas D. Bailey

A COMPARISON of fuel-source costs as calculated on an energy basis shows that there is a wide variation between the various commonly used fuels. (See Table 1.) This variation in costs ranges from 5.52 cents per million B.t.u. for natural gas at the well head up to 74.6 cents for a similar amount of energy in the form of gasoline at the refinery. The comparisons as presented do not take into consideration the efficiency ratings of the individual fuels and represent the high or ultimate B.t.u. content of the fuels. All gas volumes as listed are calculated on a 14.65-psia. pressure base and a 60° F. temperature base. The coal and natural gas prices and B.t.u.-pound figures are overall averages for bituminous coal and natural gas produced in the United States. Per unit source costs represent prices at the refinery, mine, or well head.

Comparative fuel-source costs for early April 1949 are pictured graphically in Fig. 1. A glance at the figure shows the relatively low value of the source cost of natural gas as compared with the source cost of other fuels. Residual No. 6 heavy fuel oil is shown to have a slightly higher source cost than coal; however, after accumulated stocks of residual are lowered, the greater desirability and higher efficiency of residual oil will perhaps cause a much wider spread between the energy source costs of these two items. It might be pointed out that considering the many inherent fine qualities of natural gas as a fuel, 1,000 B.t.u. per cubic foot natural gas could compete successfully with other fuels even if its source cost per M.c.f. were as high as the various source costs per million B.t.u. shown for the other individual fuels.

Source Cost Trends

Trends of the various fuel energy-source costs over the past 10 years were relatively stable during the pre-war years, were frozen by OPA regulation during World War II, and then increased sharply on most commodities after the removal of price controls. During the past year the refined-products energy-source costs have declined 60.7 per cent on residual No. 6, 22.9 per cent on fuel oil No. 2, 17.7 per cent on kerosine, and 15.3 per cent on gasoline while at the same time the source-costs figures for crude oil, coal, and natural gas have been fairly constant. Even though the energy-source cost of practically all of the fuels has materially increased during the past few years, the source cost of natural gas has remained substantially at the same level. The average well-head price per M.c.f. paid for natural gas in the entire United States was about 11 cents in 1922, gradually declined to 4.9 cents in 1939 and stayed within ½ cent of that figure up to 1945 when the price was 4.9 cents per thousand cubic feet.[1] Since 1945 the price has increased slightly to the estimated April 1949 average of 5.8 cents per M.c.f.

Fuel Costs to Energy Costs

Fig. 3 is a graphical presentation of fuel costs to energy costs so arranged that it is possible to convert any fuel cost for the fuels listed into energy cost per million B.t.u. This energy cost per million B.t.u. as found from the graph also represents the equivalent energy value in cents per M.c.f. of 1,000 B.t.u. per cubic feet natural gas.

Although fuel oil No. 2 is not listed on the graph, the energy cost per million B.t.u. for various prices on

The Author

The author is a registered petroleum engineering consultant at Oklahoma City. Graduating in petroleum engineering from Oklahoma University in 1942, he was employed by National Geophysical Co. as computer on a seismograph party in southern Louisiana, then was with the Oil and Gas Commission of Arkansas as a petroleum engineer. In 1943 he was with Stanolind Oil & Gas Co., Tulsa, then affiliated with the Corporation Commission of Oklahoma as petroleum engineer for the Oil and Gas Conservation Department before entering consulting practice.

this fuel may be calculated by using the line marked "crude oil" and multiplying the figure obtained by 0.9957.

Energy cost per million B.t.u. for a coal having a heating value other than the 13,200-B.t.u.-per-pound figure as shown on the graph may be found by using the line marked "coal" and multiplying the cost per M.M. B.t.u. figure so obtained by 13,200 and then dividing by the actual B.t.u.-per-pound figure of the coal being considered.

An example of finding the energy cost per million B.t.u. on $2.55 per barrel, 35° A.P.I. crude oil, is shown by the dashed lines on the graph. To find this cost, move horizontally to the right along the dashed line until the line marked "crude oil" on the graph is intersected. Then move downward vertically from the point of intersection to the base line at the point which shows the energy cost of this particular priced crude to be 43.7 cents per M.M. B.t.u. The graph also shows this crude oil to be the energy equivalent in cost per million B.t.u. of 43.7 cents per M.c.f. 1,000 B.t.u. per cubic feet natural gas. This graph may also be used to determine comparative energy costs of fuels for various prices on a destination or retail cost basis.

Basic Energy Equivalents

A few of the basic equivalent energy and source cost relationships between natural gas, crude oil, and coal in M.c.f., barrels, and tons respectively, using the specific gravities, B.t.u.-per-pound energy content, and source costs listed for them in Table 1, may be summarized as follows:

5.55 M.c.f. (cost $0.322) = 1 bbl. (cost $2.55)

1,000 M.c.f. (cost $58.00) = 180.1 bbl. (cost $459.29)

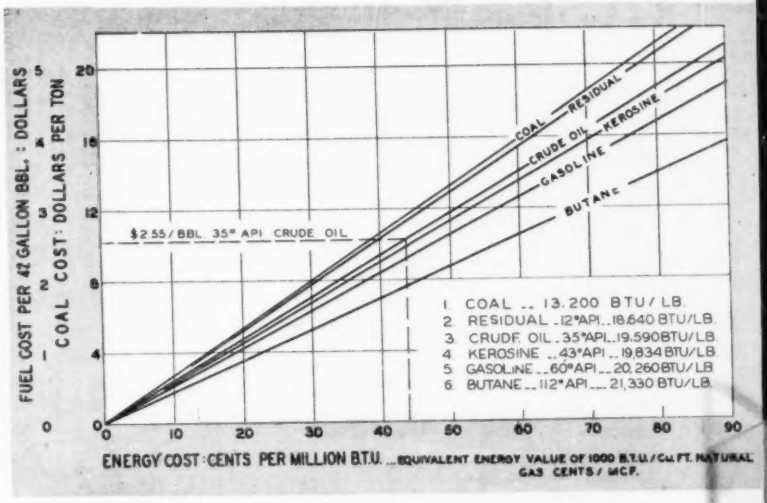
FUEL COST PER 42 GALLON BBL. : DOLLARS
COAL COST: DOLLARS PER TON
$2.55/BBL. 35° API CRUDE OIL
COAL
RESIDUAL
CRUDE OIL
KEROSINE
GASOLINE
BUTANE
1. COAL .. 13,200 BTU/LB.
2. RESIDUAL .12°API..18,640 BTU/LB.
3. CRUDE OIL..35°API..19,590 BTU/LB.
4. KEROSINE ..43°API .. 19,834 BTU/LB.
5. GASOLINE ..60°API ... 20,260 BTU/LB.
6. BUTANE ..112°API .... 21,330 BTU/LB.
ENERGY COST: CENTS PER MILLION B.T.U. ... EQUIVALENT ENERGY VALUE OF 1000 B.T.U./Cu. FT. NATURAL GAS CENTS/M.C.F.

Fig. 2—Conversion chart, fuel costs to energy costs

25.14 M.c.f. (cost $1.458) = 1 ton (cost $4.03)

1,000 M.c.f. (cost $58.00) = 39.77 tons (cost $160.29)

1 ton (cost $4.03) = 4.52 bbl..(cost $11.55)

An example of one way to use the first basic comparison to find the energy value of 1 M.c.f. of natural gas in terms of its equivalent crude-oil energy source cost would be to multiply the present price of gas by the ratio of crude oil energy to natural gas energy source costs, or 5.8 cents × $2.55 ÷ $0.322. The result which represents the equivalent energy value of 1 M.c.f. of 1,050 B.t.u. per cubic feet natural gas is found

TABLE 1—COMPARATIVE FUEL SOURCE COSTS
(April 4, 1949, Mid-Continent costs)

	Gravity	B.t.u./lb.	B.t.u./gal.*	Source costs: Per unit	Source costs: Per M.M. B.t.u. (cents)
Gasoline	60°	20,260	124,800	9.313 cents/gal.	74.6
Kerosine	43°	19,834	134,100	8.25 cents/gal.	61.5
Fuel oil No. 2	34°	19,560	139,400	7.375 cents/gal.	52.9
Butane	112°	21,330	103,400	4.0 cents/gal.	38.7
Crude oil	35°	19,590	138,800	$2.55/bbl.	43.7
Residual No. 6	12°	18,640	153,240	$1.05/bbl.	16.3
Coal		13,200		$4.03/ton†	15.3
Natural gas	0.625	‡22,073		5.8 cents/M.c.f.§	5.52

*U. S. Dept. of Commerce Bureau of Standards Misc. Pub. 97 and Pub. C-420. †United States average for January 1, 1949. ‡Equivalent to 1,050 B.t.u. per cu. ft. §Estimated United States average for January 1, 1949.

TABLE 2—COMPARATIVE FUEL PRICES IN CHICAGO USING APRIL 4, 1949, MID-CONTINENT SOURCE COSTS AND OKLAHOMA-TO-CHICAGO TRANSPORTATION RATES

	Lb. per M.M. B.t.u.	Transportation rates: Per 100 lb. (cents)	Transportation rates: Per M.M. B.t.u. (cents)	Wholesale cost per M.M. B.t.u.: Source (cents)	Wholesale cost per M.M. B.t.u.: Chicago (cents)
Gasoline	49.36	*22.42	11.07	74.6	85.7
Kerosine	50.42	*23.00	11.60	61.5	73.1
Fuel oil No. 2	51.12	*†16.03	8.20	52.9	61.1
Butane	46.88	59.82	28.05	38.7	66.7
Crude oil	51.05	*‡12.77	6.52	43.7	50.2
Residual No. 6	53.65	46.20	24.79	§17.9	42.7
Coal (lump)¶	83.33	13.65	11.37	19.79	31.2
Natural gas‖	45.30	*16.60	7.52	3.58	11.1

*Pipe line; others rail. †Estimated—48 cents per barrel. ‡Includes a pipe-line transportation charge of 28 cents per barrel from Oklahoma to East Chicago and also a gathering charge of 10 cents per barrel from the well head into the pipe line. §Using average of the Chicago quoted wholesale price of $1.10-$1.20 per barrel (basis Group 3) as listed in the April 2, 1949, Chicago Journal of Commerce. Present prices in Chicago area are lower. ¶For a 12,000 B.t.u. per lb. Central Illinois bituminous coal—average mine cost 4.75 per ton—railroad shipping charges from Central Illinois to Chicago $2.73 per ton. ‖For 1,081 B.t.u. per cubic foot natural gas produced from Panhandle field of Texas—well head cost 3.87 cents per M.c.f.

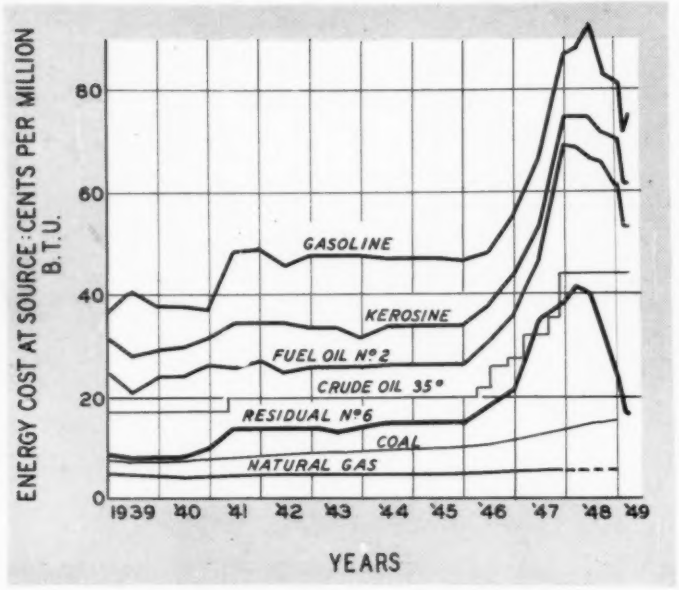

Fig. 3—Comparative fuel-source energy-cost curves (Mid-Continent costs on crude oil and refined products; U. S. costs on coal and gas)

to be 45.93 cents. The same result could also be obtained from the second basic comparison by dividing $459.29, the equivalent crude-oil energy source cost of 1,000 M.c.f. by 1,000. Equivalent energy values of one fuel in terms of the energy source cost of energy in the form of other fuels may be determined in a similar manner.

Wholesale Destination Costs

Calculated wholesale costs per million B.t.u. energy content in Chicago for several of the fuels (see Table 2) show that natural gas is by far the cheapest fuel. The 11.1 cents per M.M. B.t.u. figure for natural gas at the Chicago city gate is about 50 per cent of the average price paid at point of consumption for natural gas over the entire United States. This average consumer price was 22.4 cents in 1935 and fluctuated very slightly through the years up to 1945 when the price was 21.4 cents per thousand cubic feet.[1]

Chicago wholesale costs for the fuels, gasoline, kerosine, fuel oil No. 2, butane, and crude oil were determined by using April 4, 1949, Mid-Continent source costs and Oklahoma-to-Chicago transportation rates. The residual No. 6 cost is for residual listed in the April 2, 1949, Chicago Journal of Commerce; the coal cost is for bituminous coal produced in Central Illinois and shipped via railroad to Chicago; and the natural-gas cost is for natural gas produced in Texas Panhandle field and transported by pipe line approximately 900 miles to the Chicago city gate. All transportation rates as listed are for pipe-line transportation except in the case of the railroad rates listed for butane and coal. The transportation rates per million B.t.u. for the various fuels show that the pipe-line charge for transporting natural-gas energy is lower than the charges made for transporting energy in the form of other fuels.

Analysis of Mineral Energies

A breakdown of the estimated 34,882 trillion B.t.u. of mineral energy produced during the year 1948 in the United States at a total source cost of approximately $8,535,000,000 shows that coal supplied 45.9 per cent of the energy for 30.7 per cent of the source cost, liquid hydrocarbons supplied 36.5 per cent of the energy for 65.3 per cent of the cost, and natural gas supplied 17.6 per cent of the energy for 4.0 per cent of the total cost.

An analysis of the proved hydrocarbon fuel energy reserves of the United States shows the following outstanding facts:

1. The nation's natural-gas reserve weighs more than the entire liquid hydrocarbon reserve.

2. The natural gas reserve has approximately 53 per cent of the total B.t.u. energy content of our total hydrocarbon reserves.

3. The production of energy in the form of natural gas at present is approximately one-half the energy produced in the form of liquid hydrocarbons.

4. The total value at the present price of our natural gas reserve is only about one-seventh of the value of our liquid hydrocarbon reserves.

5. Current production of our nation's natural-gas energy is now actually selling at the well head for about the value presently being paid for a one-eighth royalty interest on a similar amount of energy in the form of crude oil, condensate, and other natural-gas liquids.

It might be concluded that if the present low source cost of natural-gas energy continues to exist and if the present upward trend of gas-transmission pipe-line construction continues to gain momentum, other competitive fuels will probably have to lower their prices in order to compete with natural gas. Crude oil of 35° gravity and 13,200-B.t.u.-per-pound bituminous coal, which now sells for $2.55 per barrel and $4.03 per ton, respectively, would, in order to compete on an energy basis with natural gas, have to be reduced at their source to 32.2 cents per barrel for the crude and $1.46 per ton for the coal.

Reference

1. Minerals Yearbook—1946, pp. 806-807.

TABLE 3—ANALYSIS OF UNITED STATES HYDROCARBON FUEL ENERGY RESERVES
(January 1, 1949)

	Liquid hydrocarbons	Natural gas
Proven reserves	26,821 million bbl.*	168,653 million M.c.f.‡
Average gravity, est.	35° A.P.I.	0.625§
Weight	297.6 lb. per bbl.	47.57 lb. per M.c.f.
	7,981 billion lb.	8,023 billion lb.
Energy content	19,590 B.t.u. per lb.	22,073 B.t.u. per lb.
Total energy content	156,350 trillion B.t.u.	177,090 trillion B.t.u.
Average present source cost, est.	$2.55 per bbl.	$0.058 per M.c.f.
	or 0.857 cents per lb.	or 0.1219 cents per lb.
Total value at present price	$68,394 million	$9,782 million
Value per M.M. B.t.u. at present price	43.7 cents per M.M. B.t.u.	5.52 cents per M.M. B.t.u.
Production in 1948	2,186 million bbl.†	5,827 million M.c.f.¶
Energy content	12,744 trillion B.t.u.	6,118 trillion B.t.u.
Producing life at 1948 rate of prod.	12.27 years	28.94 years

*Includes 23,280,444,000 bbl. of crude oil and 3,540,783,000 bbl. of natural-gas liquids. †Includes 2,002,448,000 bbl. of crude oil and 183,749,000 bbl. of natural-gas liquids. ‡American Gas Association reserve figure of 173,869,340,000 M.c.f. reduced by 3 per cent to allow for shrinkage caused by removal of natural-gas liquids. §Equivalent to 1,050 B.t.u. per cubic foot 0.625° gravity natural gas. ¶American Gas Association 1948 United States production figure of 6,007,628,000 M.c.f. reduced by 3 per cent to allow for shrinkage caused by removal of natural-gas liquids.

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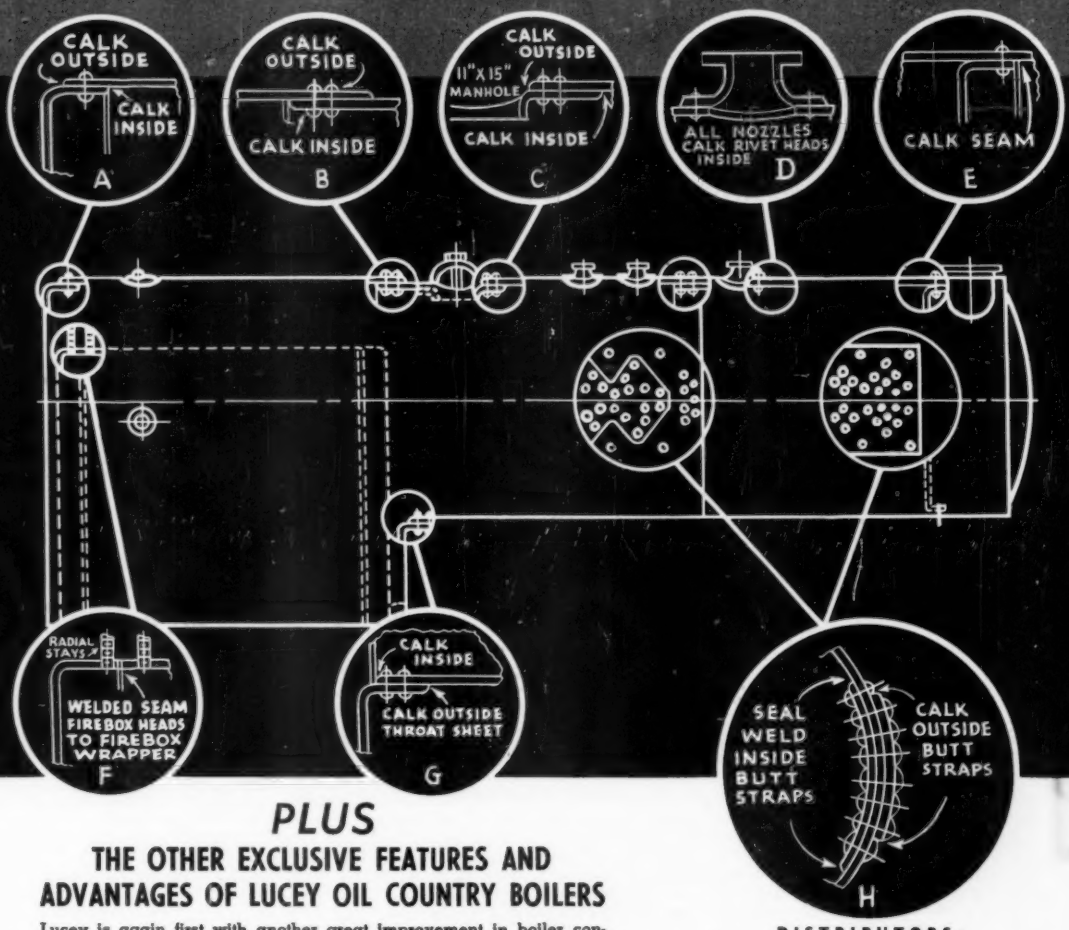

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GAMMA RAY Of Drag-Type Rotary

OIL-WELL drilling tools and related products may be inspected by using radium to "see through" the finished parts. The particular parts discussed here are the blades attached to a drag-type oil-well drilling bit. The cutting blades of drag bits used in drilling oil wells must be designed to withstand extreme degrees of impact and abrasive wear, even when drilling in relatively soft formations. The blade can be made resistant to impact by proper design, selection of the proper alloy steel, and proper heat treatment.

To provide resistance to abrasive wear, the blade is covered on its active surfaces with particles of an extremely hard alloy of tungsten. The actual cutting edges and reaming edges are further reinforced to withstand abrasive wear by the use of inserts of a similar tough alloy. The design of the bit varies somewhat with the special requirements of local drilling conditions.

Placement of reinforcing inserts and the covering, or dressing, of the active surfaces with particles of the hard alloy is performed in a welding operation. Fig. 1 shows the blade after the inserts have been welded into place and most of the surface of the blade covered with particles of the alloy fused to the steel by welding.

In such an operation the quality of the finished product is entirely dependent upon the technique of the individual welder. Only the best type of welder should be used for this work, but even the best are subject to an occasional lapse in attention to the exacting details of placement and judgment involved. An improperly placed insert can drastically shorten the effective life of the drilling tool. In any such case where the human element is so important, it is imperative that some way be found to inspect the finished product thoroughly.

*Chemist, Reed Roller Bit Co., Houston.

Radium Inspection

The answer to this problem is radiographing of the finished blades. There is a marked difference in density between the hard metal alloy and the steel body of the blade, making the shape, condition, and location of the hard metal show up sharply on X-ray type film. For this type of work it was preferable to use radium as a source of the rays, rather than to use an X-ray tube.

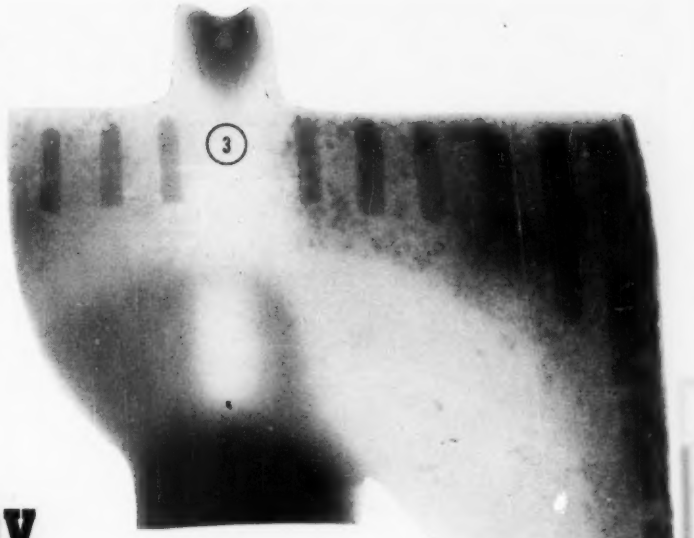
Radium generates rays known as gamma rays which comprise a portion of the X-ray spectrum, as the color red is a portion of the spectrum of visible light. The effect of gamma rays upon photographic film is similar to that produced by X-rays, ultraviolet, visible light or infrared, though films with different emulsion characteristics are selected for photography in different portions of the electro-magnetic spectrum. The films used for gamma ray radiography are identical with those used for X-ray radiography, and are called X-ray films. Radium was chosen for this work because it was more convenient to handle than more bulky X-ray apparatus and was more suited to the requirements of the problem.

By using radium, a large number of blades may be photographed at the same time, and the period of exposure may be varied to suit the needs or the convenience of the moment. A few blades may be hurriedly checked in half an hour, or a large number may be left under exposure overnight—or over a week end—by varying the distance between radium and film, and by using different types of film. These variations may be accomplished with the same capsule of radium.

Fig. 2 shows a number of blades being radiographed. The radium capsule, encased in a conical aluminum holder, is suspended above the center of the table. The blades are placed around this center and at a predetermined distance from it, with the X-ray film, in light-tight folders, immediately behind them. For reference purposes, a number is chalked upon the blade and the same number, using figures made of lead, is fixed to the film holder by means of an adhesive tape. The lead figures, being very dense to the rays, mark the film clearly and permanently.

Fig. 3 shows a positive print made from a negative obtained in this manner. The hard alloy inserts show up

1—A forged alloy steel blade after the application of a protective coating of tungsten carbide. 2—The capsule of radium is placed in the center of the circular groups of blades to be radiographed. 3—Radiograph of finished blade showing hard metal inserts and granules of hard metal. 4—Two-way drag bit before and after being dulled in the hole



Radiography Drill-Bit Blades

by J. M. Williams*

clearly as dark objects against the lighter gray tones of the steel body of the blade. The scattered particles of hard alloy covering the face of the blade show as dark specks distributed over the area of greatest wear.

In this photograph, the cutting edge is toward the top of the picture; the steel centering boss projecting above the edge will be cut away after the blades are assembled. The edge toward the right in the radiograph is the reaming edge which cuts the wall of the hole being drilled. It will be noted that there is a double row of hard alloy inserts placed along this edge to prevent the bit from wearing undersize as it is dulled.

Fig. 4 contrasts a similar bit, after one that has been used in drilling. Bits are removed from hole and returned to the factory for replacement of the worn blade when they no longer drill at a satisfactory rate. The removal of a bit from the hole is an expensive, time-consuming operation, since it involves raising and disconnecting a long string of drill pipe to bring the drilling bit to the surface. As the cost of this operation far exceeds the cost of the bit, these tools are discarded after being withdrawn from the hole, even though it may be apparent, after the tool reaches the surface, that it still retains a large portion of its cutting life.

It will be noted in the case of the photographed used bits that the hard metal inserts along the cutting edge have served their function of reinforcing the steel body of the blade to such an extent that the steel immediately behind them is retained in the form of projecting teeth, while the unprotected steel between the inserts has been worn away in grooves. It will also be noted that even though the cutting edges have been worn down, the circumference of the bit remains substantially the same as when new.

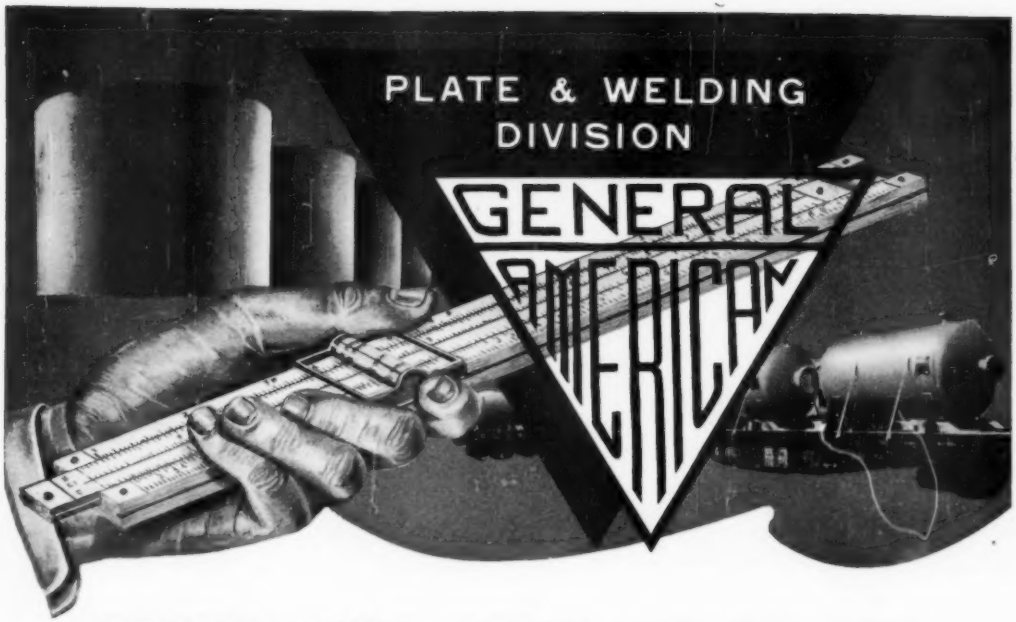
Making the Radiograph

In the radiographic setup shown in Fig. 3, the blades are arranged around the radium capsule at a distance of about 24 in. The thickness of steel to be penetrated is between ¾ and 1 in. Using a film of medium speed, a good negative is obtained with an exposure of 2½ hours. In this case, the quantity of radium used is 100 mg. By doubling the amount of radium, the time exposure could be cut in half. By varying the distance between the radium and the film, the exposure time can be varied in accordance with the inverse square law; doubling the distance would multiply the time by four; halving the distance would divide the exposure time by four.

There are other variations that can be used by the technician to improve the quality of the radiograph or to bring out specific details. In the particular operation discussed here, it was necessary to obtain negatives that would provide good positive prints. The welders could not be expected to interpret a radiograph; and it was undesirable to have the negative handled excessively when it was to be retained as a permanent record. By furnishing the welders with good positive prints, they are able to get a clearer picture of their work, and the negative remains in the laboratory files.

Such inspection is relatively inexpensive. Although radium is a highly expensive material, it may be considered a practically indestructible investment as a source of gamma rays, its effective life being in the neighborhood of 1,500 years. Furthermore, it need not be purchased outright, but may be rented on a monthly basis for a nominal fee. Certain precautions are necessary in its use, but they are not burdensome. There is no residual radiation from the metal subjected to the rays; it is affected no more than if it had been exposed to light. The X-ray film is inexpensive and simple to process.

The success of any operation lies in the service it performs. Through proper design, effective cutting action is assured in these oil-well drilling bits. Through proper selection and placement of hard alloy reinforcement, the effective life of the tool is prolonged. Through adequate inspection, the danger of defective material reaching the field is minimized.



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Engineering problems solved in the laboratory are problems no longer — yet in steel and alloy plate fabrication there are factors where the right answers yield more readily to common sense than to the slide rule.

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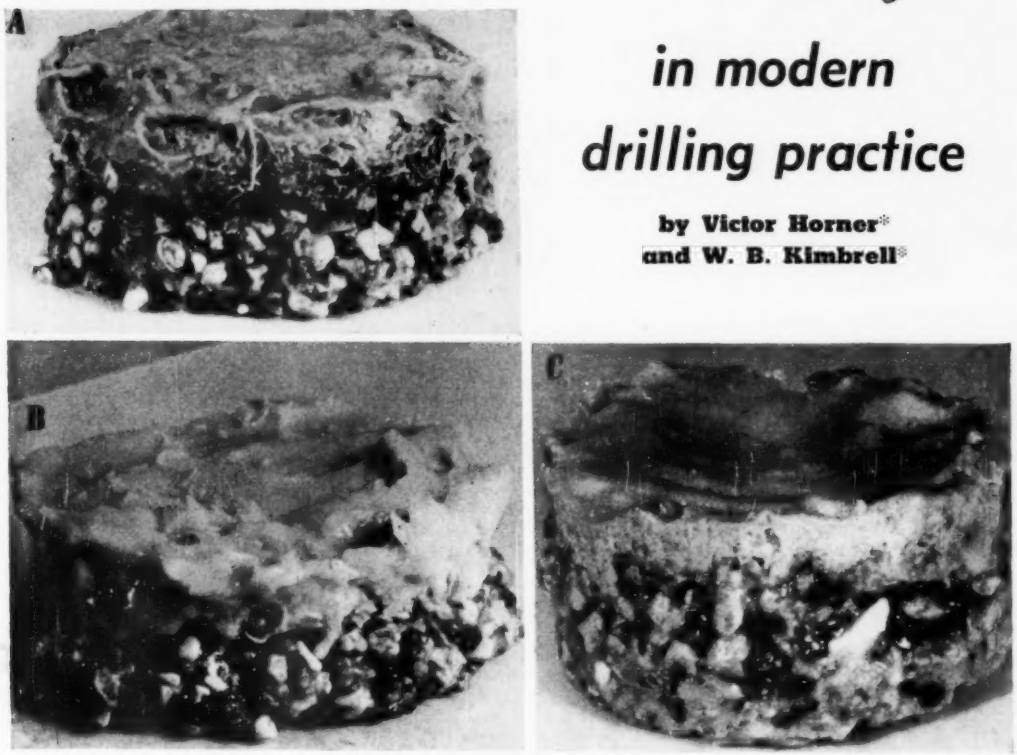
Mud Control and Design in modern drilling practice

by Victor Horner* and W. B. Kimbrell*



Photos of mud materials used in prevention of lost circulation: (A) fibrous material, (B) silver foil, (C) mica

DRILLING fluids have become a major tool in the advancement of drilling technique and have opened an engineering field of vast importance to the oil industry. It has been well established that the inflow of gas or fluids and loss of drilling fluid are controlled by the correct application of hydrostatic principles and control of mud friction factors. Other factors in the selection and use of drilling fluids are:

Transportation of cuttings is a matter of carrying power expressed through viscosity and gelation properties, with consideration given to proper flow characteristics.

Shale caving or sloughing is greatly influenced by the degree of water wetting of the shales.

The filtration cake deposited on the wall of the hole is related to mud quality and is a common source of trouble but subject to correction.

*Baroid Sales Division, Tulsa. Paper presented at American Institute of Chemical Engineers regional meeting, Tulsa, May 8-11.

Protection of permeability in reservoir zones is related to the chemical makeup of a mud and is a factor in initial production rate.

Abrasive and corrosive actions of a mud are of sufficient importance to be controlled.

Electric-logging data are dependent upon the chemical character of a mud.

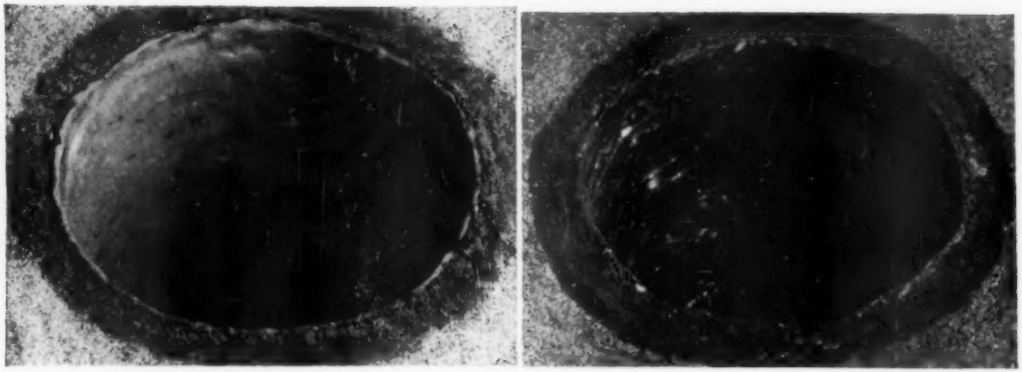
The above functions cover a broad field, some are interrelated, but as a whole, they are independent and each is sufficiently important and complex to justify specialized study.

Weight Control

High-specific-gravity weight minerals (barite) have long been employed as an additive to drilling fluid for increasing mud density in the control of inflow of gas or fluids from the drilled formations. Mud weights in the 15 to 19-lb.-per-gallon range are in common use with today's deeper drilling, and present a complex problem in their design and control. Muds in this weight range must remain fluid with a minimum viscosity to allow the removal of entrained gas.

In preparing a weighted mud, barium sulfate, with a specific gravity of 4.3, is added to a prepared base mud, or to a base mud already in use in the drilling operation, and usually containing low-specific-gravity suspending material. As the weighting material is added for increased fluid density, the total effective volume percentage of solids increases. Dependent upon the effective per cent volume of low-specific-gravity material originally in the base mud, the amount of barite addition is, therefore, limited by resultant viscosity and gel strength. The same effect is realized when a weighted mud with satisfactory viscosity and gel strength properties is in use in drilling formations that add to the low-specific-gravity concentration; viscosity and gel strength increases would be expected.

Considering practical operating limits of viscosity and gelation, as weight



Photos illustrating appearance of wall cakes (muds): (left) low-filter-loss mud: (right) high-filter-loss mud

requirement for a specific mud increases, or addition of low-specific-gravity solids occurring through drilling, the effective volume percentage of low-specific-gravity suspending material must be reduced. This may be done (1) by dilution and addition of barite; (2) by dehydrating the low-specific-gravity particles, or (3) by employing a higher-specific-gravity solution phase.

Fig. 1 is a hypothetical representation of the viscosity-weight relationship of weighted muds showing the

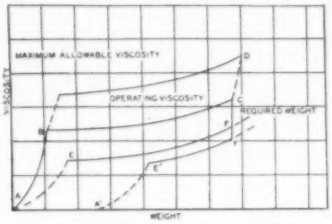


Fig. 1—Weight-viscosity relationship weighted mud

governing limitations and control approach. The line AB represents a hydrated or semihydrated clay added to fresh water as a suspending agent for the addition of barite along line B to C. The point C represents a mud designed for a required weight at operating viscosity. As low-specific-gravity solids are incorporated in the weighted mud along CD through drilling progress, the tendency of the mud is to increase slightly in weight and to increase in viscosity until the maximum allowable viscosity for release of entrained gas or fluid pumpability is reached at D. To control the viscosity below the maximum allowable, this mud may be diluted with fresh water to reduce the percentage of low-specific-gravity solids with addition of barytes, if necessary, to maintain the required weight.

A second control method would be the chemical dehydration of the base clay AB or any hydrated clay added through drilling, CD, with the yield of these low-specific-gravity materials depressed to assume the position AE, which, together with the assistance of the high-specific-gravity weighting material along EF, would provide a reduced-viscosity mud at the required weight at F. The third design or control method would be the use of a higher-specific-gravity liquid phase, such as saturated salt water. In this case the dehydrated base clay would assume the position of A'E' when mixed with the higher-specific-gravity liquid phase, and with the further addition of barytes along E'F' a mud would be provided with the required weight of a low viscosity.

Considering the limitation of viscosity, it may be noted that much higher-weight muds may be prepared and controlled through the latter two design methods. The high-weight muds in use today, vis., mud in the range of 15 to 19 lb. per gallon, are mostly of these types.

Control of highly weighted muds generally involves the matter of circulation loss where the mud weight must be controlled between the maximum permitted breakdown weight and the minimum required to overcome the formation pressures at hand. This condition generally places the weight at a fixed value with very little control tolerance. An understanding of the viscosity-weight relationship of weighted muds is particularly important in the design and control of such critical cases.

Viscosity and Gelation Control

Proper transportation of cuttings depends on the "carrying" power of the drilling mud to lift bit cuttings to the surface and yet allow the finer cuttings, not removed by the shale shaker, to settle in the surface pits. Viscosity and gelation control are related to the mechanical drilling operations where annular velocity, drilling rate, and mechanical hole erosion must be considered.

Because of its great ability to swell in water, bentonite has been the most widely used viscosity builder. Where viscosity is required in the design or control of a fresh-water drilling mud, the high yield (expressed as the barrels of 15-cp. mud per ton of clay) of Wyoming bentonite makes the material particularly adaptable for this purpose (Fig. 2). Other special clays

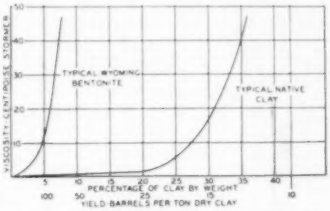

TYPICAL WYOMING BENTONITE
TYPICAL NATIVE CLAY
VISCOSITY, CENTIPOISE, STORMER
PERCENTAGE OF CLAY BY WEIGHT
YIELD BARRELS PER TON DRY CLAY

Fig. 2—Viscosity-percentage of solids relationship-fresh water

have been developed and are in use for providing viscosity and gel strength in saline solutions.

Generally, improvement of flow characteristics through reduction of viscosity and gel strengths in fresh water-bentonite muds commands greater attention than increasing these values. Increases in viscosity and gel strengths due to hydration of clays from bit cuttings and hole erosion caused by drill-pipe move-

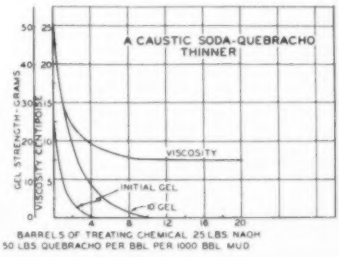


Fig. 3—Viscosity-gel strength reduction native fresh-water mud

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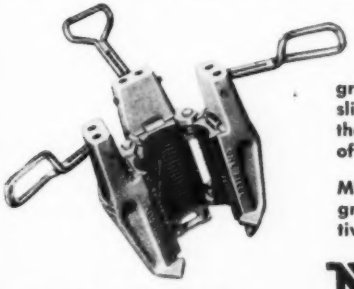

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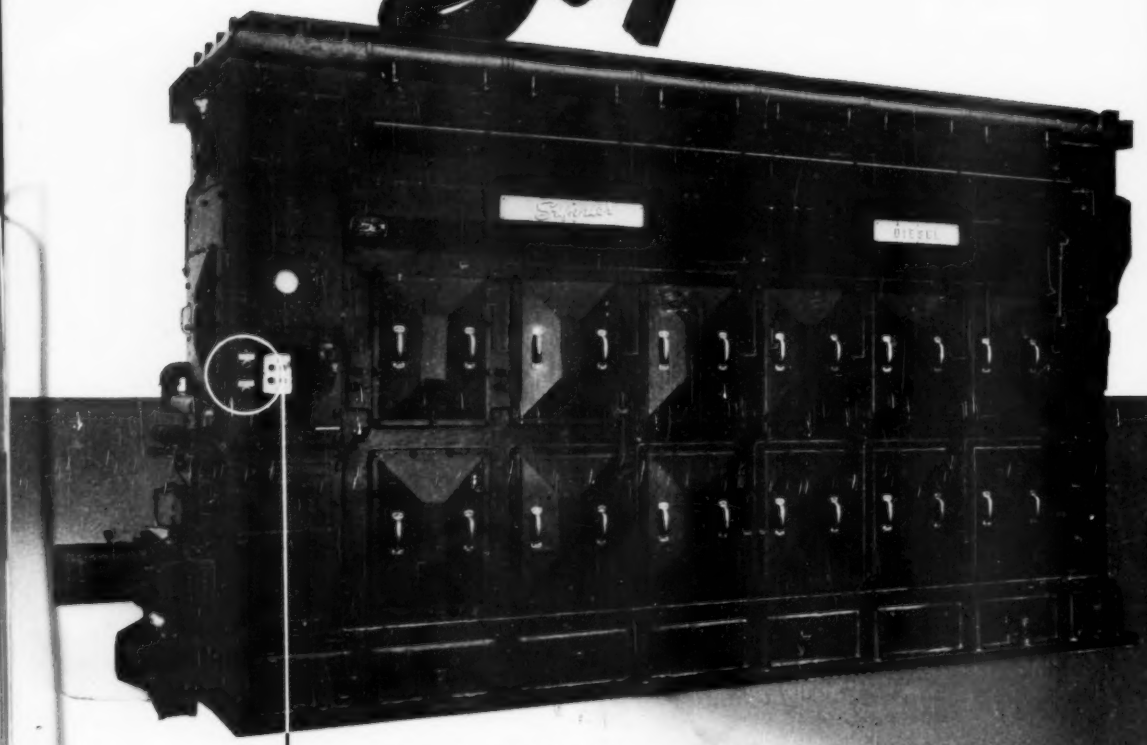

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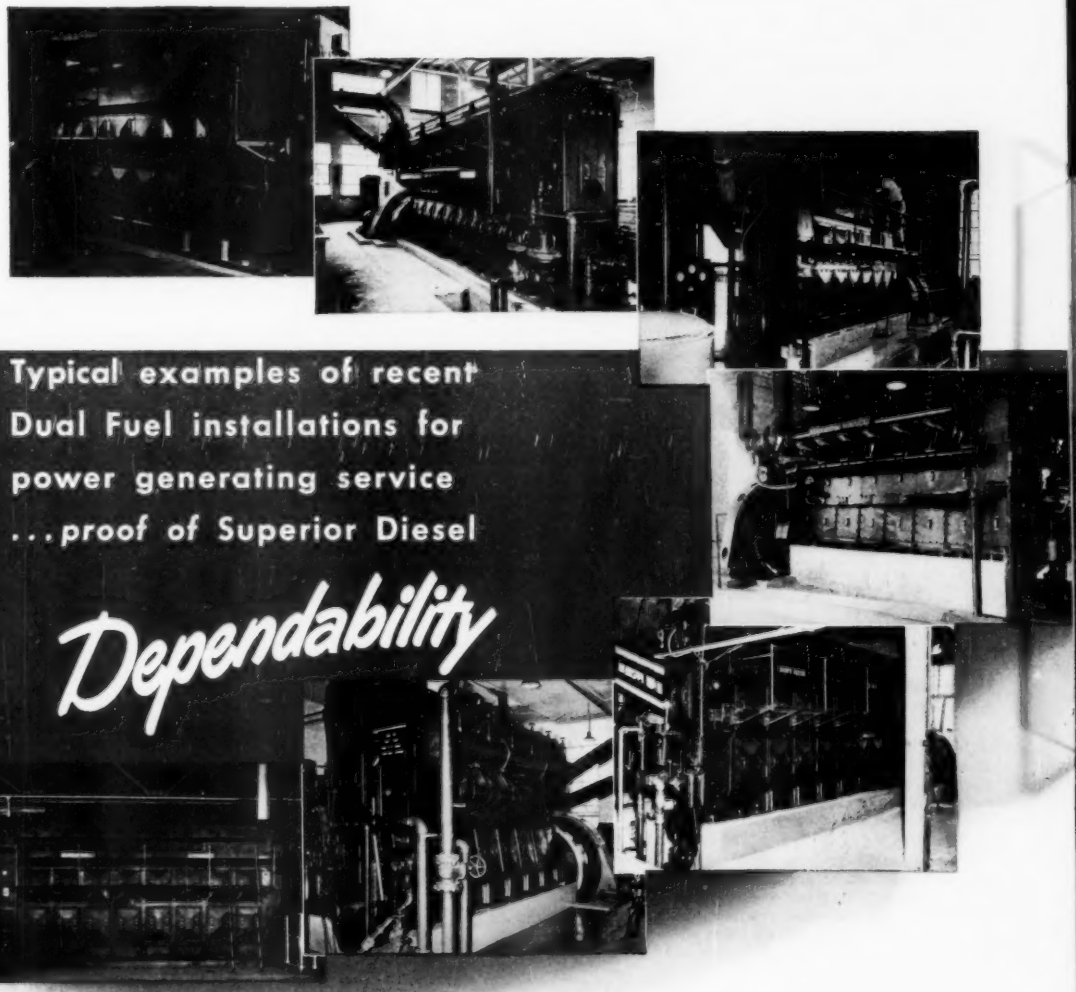

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LINE OF OIL FIELD EQUIPMENT ★ FOR PRODUCTION

ment are common problems. Use of water, tanstuff, and the polyphosphates to reduce viscosity and gel strengths are control methods in common use. Fig. 3 shows the action of a chemical thinner on a typical native fresh water-bentonite mud.

Control of Filtration Properties

The factor of water-wettable shales involves control over the filtration properties, and development has depended upon the application of knowledge on colloidal suspensions. To minimize the filtration rate of a drilling mud requires consideration as to the type of colloidal material, colloidal particle-size distribution, the degree of dispersion and the concentration of the colloid used. Common sources of colloidal particles are from clays, bentonites, starch, and other organic colloids.

One method of control involves the use of chemical mud thinners such as some of the tannin compounds and complex phosphates. They have been very effective in reducing the viscosity and gel strengths of muds to permit much higher concentration of colloidal particles for a given viscosity, and in controlling flow characteristics and filter loss in fresh water-bentonite type muds. Fig. 4 illustrates the effect of concentrating colloidal particles through the thinning action of caustic soda-quebracho and addition of bentonite on water loss reduction of fresh-water native mud.

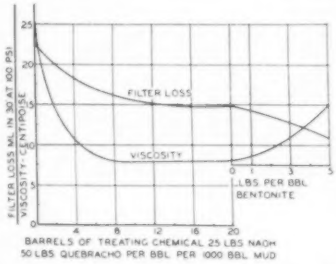

FILTER LOSS
VISCOSITY
LBS PER BBL BENTONITE
BARRELS OF TREATING CHEMICAL 25 LBS NAOH
50 LBS QUEBRACHO PER BBL PER 1000 BBL MUD

Fig. 4—Filter-loss reduction native fresh-water mud thinner plus bentonite

The colloidal particles supplied by bentonite and other clays are chemically active, and their behavior is influenced by chemical contamination; the multivalent cations have severest effect. The basis of chemical control of contaminants affecting viscosity, gel strength, and filter-loss characteristics involves reactions where the multivalent cations are converted into an insoluble form and replaced by a single valent cation, generally sodium. This type treatment will minimize the flocculating forces and render the mud more fluid with a given concentration of colloidal particles.

Fig. 5 depicts the effect of low calcium ion concentration on mud characteristics and the restoration of desirable properties by removal of the calcium ion through precipitation. It is not the intent of these curves to cover the range of contaminate concentration and treatment, but rather to illustrate the effect of the presence of the multivalent cation calcium, in low concentrations, on mud properties. Control of such contamination can be effected by the use of sodium bicarbonate in the case of cement, by the use of sodium carbonate or barium carbonate for anhydrite. Regarding the latter, use of soda ash is limited by the concentration of sodium sulfate formed by the reaction, which can, in high concentrations, prove detrimental to most muds. Heavy anhydrite contamination is very effectively treated with barium carbonate, which removes calcium sulfate in its entirety.

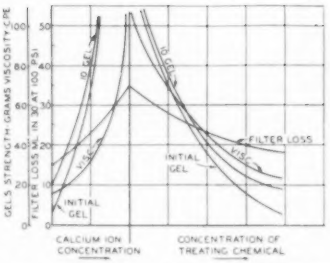


Fig. 5—Effect of low calcium ion concentration on mud characteristics

More recently, attention has been given to special types of colloidal materials for control of mud-filtration properties. It has been found that extremely low filter-loss control depends upon maintaining a percentage of the colloidal material in the lower size range, and that a pliable-type particle is desirable. The starch particle has been used effectively for this purpose and has afforded a means of producing extremely low filter rates. A sterile condition must be provided through use of bactericides, high salinity, or high alkalinity. Starch is also extremely useful in that it is unaffected by high chemical concentrations. As a result, low-filter-loss muds can be produced under condition of saturated salt Fig. 6.

The synthetic product, sodium carboxymethyl cellulose, has similar characteristics and is finding application along the same line. In many applications this cellulose derivative has an even greater weight efficiency than commercially prepared starch in water-loss reduction, and in addition presents very little fermentation hazard. These advantages are to some extent offset, however, by a higher price per unit weight.

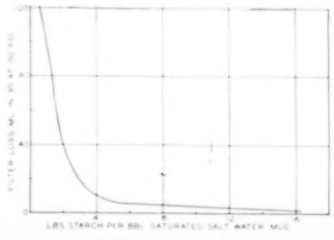


Fig. 6—Filter-loss-reduction starch in saturated salt water mud

Chemically dehydrating the clay particle in a conventional water-clay mud by the use of slacked lime allows the preparation of a very stable mud having a wide application. In converting to a mud of this type, caustic soda and quebracho along with any necessary water dilution, are usually employed to assist in raising the alkalinity and to control viscosity and gel strength increases. The magnitude of viscosity increase during the dehydration process depends mainly on the concentration of hydrated clays in the original mud.

Starch is used to reduce filter loss and the resulting mud is a very stable composition of starch and nonhydrated solids in a calcium-saturated high-pH solution. Such muds are particularly adaptable where high weights are required, are not affected adversely by chemical contamination, and through proper maintenance are very stable in regard to weight, viscosity, and gel strength. Fig. 7 illustrates the change in mud characteristics for a lime-converted mud.

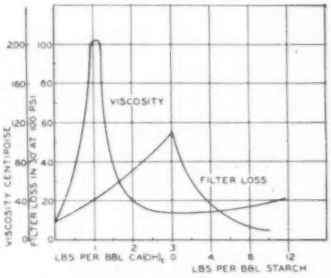
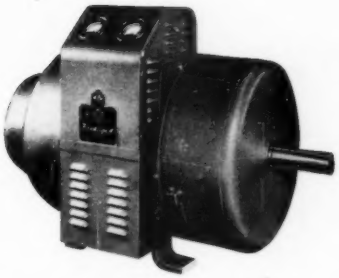


Fig. 7—Characteristics of lime-converted mud

A factor related to mud quality and filtration properties of a drilling fluid is the thickness of the filter cake deposited on the wall of the hole. This filter cake is usually proportional to the filter loss for a given mud. The two accompanying photographs are visual representations comparing the effective diameter of a hole in sand in which a low filter loss mud has been circulated, and one in which high-filter-loss mud has been circulated. The high-filter-loss mud reduced the 8⅝-in. diameter to 6⅝-in. and illustrates the importance of minimizing cake thickness from the standpoint of sticking drill pipe and testing tools.

Where formation porosity and permeability are great enough to permit

(Continued on page 113)



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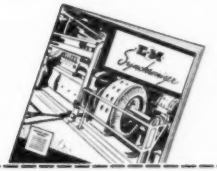

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Production of Chemicals by Oxidation Of Natural-Gas Hydrocarbons

by M. F. Wirges and J. W. Palm

Production of chemicals by direct oxidation of natural gas has been of increasing industrial interest since installation of the pioneer plant by Cities Service Oil Co. at Tallant, Okla., in 1928. After installation of the Tallant plant, other plants were constructed by Cities Service near Oklahoma City and Seminole, Okla. Direct oxidation of hydrocarbons has recently been employed by Celanese Corp. near Bishop, Tex., and by McCarthy Chemical Co. in its plant near Winnie, Tex.

Considerable data have been published concerning this reaction and flowsheets of the processes in use have been published.[1] [2] The purposes of this paper are to give a general discussion of methods of carrying out the oxidation reaction and to summarize the data concerning the effect of the important variables on the reaction. The authors are with Cities Service Oil Co. at Tallant, Okla. The article is a portion of a paper presented at the regional meeting of American Institute of Chemical Engineers, Tulsa, May 8-11.

FOR process consideration an oxidation plant may be divided into two units—the primary oxidation, where the crude chemicals are obtained, and the chemical refinery.

A process for oxidation of hydrocarbons will consist of the following basic steps (see Fig. 1): compression of the reacting gases, preheating to the desired temperature, reaction, cooling and condensing, product separation, and product gas treatment. Considerable flexibility is possible in the design of a plant to carry out these steps.

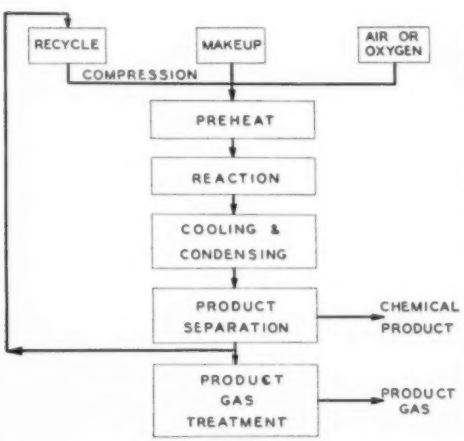
The makeup gas may consist of any of the natural-gas hydrocarbons in the C_1-C_5 range or mixtures of these hydrocarbons. The relative value of the makeup gas will determine the extent to which it must be utilized. With the higher-molecular-weight makeup gases it is necessary to obtain high conversions of hydrocarbons to chemicals by employing recycle and by recovering any unreacted hydrocarbons from the product gas. With makeup gases high in methane content, which have a low unit cost, it is not economically necessary to obtain complete conversion of hydrocarbons to chemicals since the product gas may be utilized for fuel or other purposes.

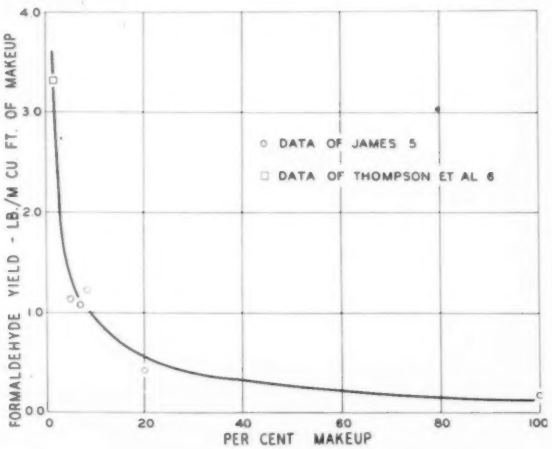
Oxygen, air, or other oxygen-containing gases may be used as the oxidizing medium. Until recently oxygen has not been utilized as the oxidizing medium because of its high cost. When using air in a recycle system it is necessary to remove a portion of the product gases from the system and hydrocarbons are carried out with this gas. With commercial oxygen in a recycle system the amount of product-gas removal is reduced to a minimum because of the smaller amount of nitrogen or other inerts entering the system.

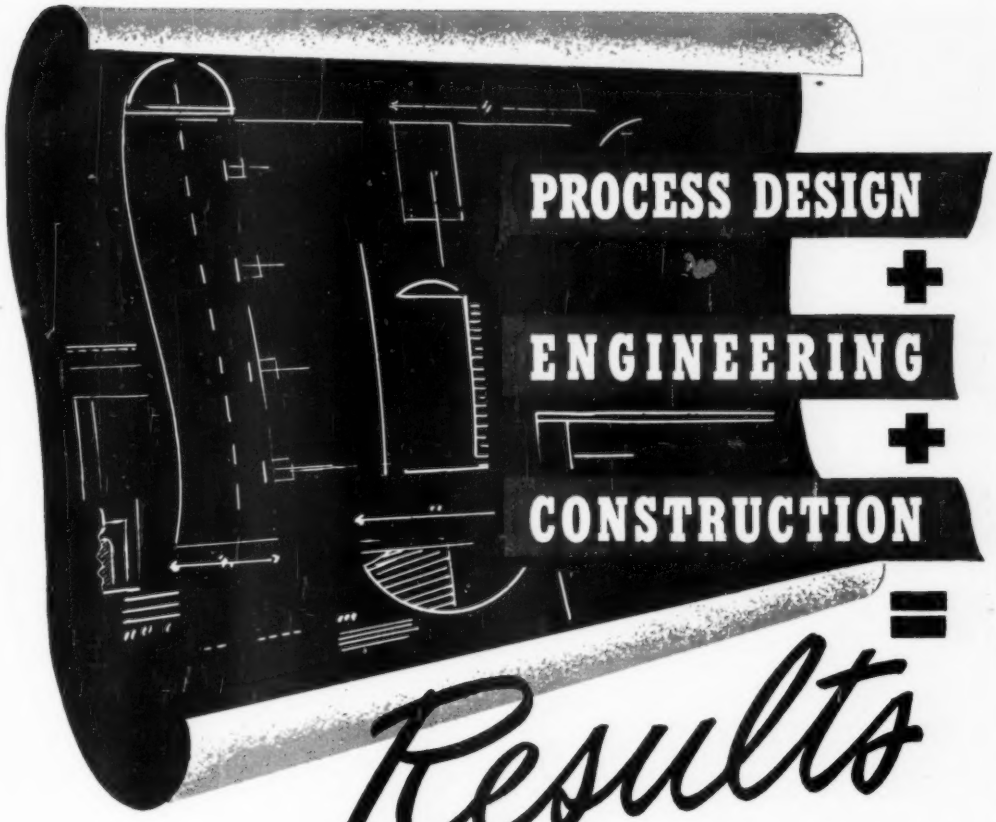
With single-pass operation the use of commercial oxygen results in a minimum of inert-gas contamination of the product gases. The cost of compressing to the operating pressure is much smaller for oxygen than for air. This is an appreciable factor when operating at high pressures.

It is necessary to preheat the streams entering the reactor to a certain minimum temperature to initiate reaction. The recycle, makeup, and air may be preheated separately, or may be mixed and preheated together. It is also possible to use unpreheated air by preheating the hydrocarbon streams to such a temperature that the desired preheat temperature is obtained upon mixing the

Fig. 1—(Left) Steps in the production of chemicals by oxidation of natural-gas hydrocarbons. Fig. 2—(Right) Effect of per cent makeup on formaldehyde yield







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streams as they enter the reactor.

It is necessary to cool the outlet gases from the reaction step. The preheating and cooling steps may be combined by using gas-to-gas heat exchangers to preheat the entering streams and to partially cool the product gas streams. The final cooling of the product gas may be done with conventional surface condensers. An alternate method is use of gas-fired heaters for preheating, with quenching or water-cooled exchangers for cooling the product-gas stream. Quenching consists of contacting the hot gases from the reactor with a large volume of cool liquid. The principal advantage of the quench method is very rapid cooling of the hot gas, which terminates any secondary reactions. Its principal disadvantage is that the sensible heat content of the product gases is not utilized; thus an equivalent amount of heat must be furnished by burning fuel gas in a gas-fired preheater.

Reaction Step Is Key to Process

The key to the oxidation process is the reaction step. Since the reaction is exothermic, provision must be made for absorbing the heat liberated. Various conventional methods of removing heat from the reaction zone may be used; however, the temperature rise of the reaction gases is commonly used to absorb the heat of reaction.

No special materials of construction are required for the reactor. The most important consideration in the reactor design is the reaction time; the reaction time must be short and should be held within rather narrow limits.

After the reaction gases have been cooled, the liquid product or quench solution is separated from the gas stream and sent to the chemicals-refining section. The product consists of a water solution of a number of chemical compounds, including substantial amounts of methanol, formaldehyde, acetaldehyde, and acetone with smaller amounts of acids and higher alcohols, aldehydes, and ketones. Refining processes have been developed for the separation and purification of these crude chemicals.[1,3,4]

After removing the chemicals from the product gas, a portion of it may be recycled to the reactor; in addition, product gas is removed from the system at a rate sufficient to hold the reactor pressure at the desired value. The product gas withdrawn from the system may be treated to recover any unconverted higher hydrocarbons, which may be returned as additional makeup to the reactor. Any of the conventional methods of recovering hydrocarbons such as oil absorption, chilling or adsorption may be used.

Discussion of Operating Variables

With any given plant design the amount of chemicals produced is affected by a number of variables, the most important of which are pressure, temperature, makeup composition, recycle, catalysts, and reaction time. These variables are discussed below.

Pressure.—In general the yield of liquid product, and up to a certain point also the quality, increase proportionately with an increase in pressure. However, pressures above 400 to 500 psig. are more favorable to alcohol rather than aldehyde production.

In Table 1 results from atmospheric operation[5] are compared with operation 250 psig.[6] both using methane-rich makeup gas.

As may be seen from Table 1 the increase from atmospheric pressure to 250 psig. resulted in a 102 per cent increase in formaldehyde yield. Carbon converted to carbon dioxide increased 56 per cent while the carbon converted to formaldehyde increased 96 per cent. Thus, higher pressure not only increased the over-all conversion, but the increase in conversion to chemicals was greater than the increase in conversion to carbon dioxide and carbon monoxide.

Temperature.—If the heat given off by the reaction is absorbed by the reaction gases there is a rise in temperature as the gases pass through the reactor. The temperature of the gases entering the reactor is termed the preheat temperature and the maximum temperature of the gases as they pass through the reactor is referred to as the reaction temperature. The temperature rise of the reacting gases is dependent upon the amount of reaction obtained, i.e., with a given reaction temperature a decrease in preheat temperature gives an increase in production.

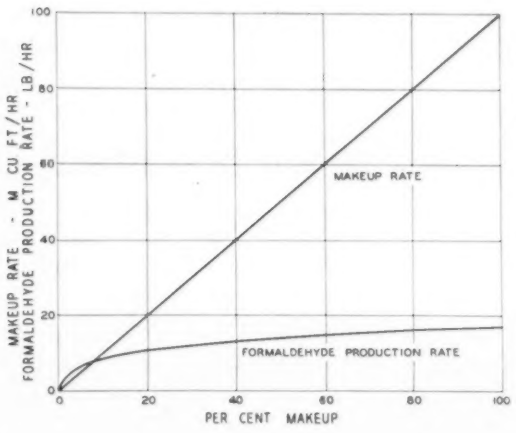
The preheat temperature is limited by the minimum temperature at which the reaction will initiate. The use of higher pressures and richer feed gas may be accompanied by a decrease in preheat temperature. With a given preheat temperature, an increase in reaction temperature increases the quantity of product but decreases the concentration of chemicals in the product. The oxidation reaction may take place at a temperature of 600°-1,000° F.; the preferred temperature for the reaction is normally in the range of 840° to 880° F.

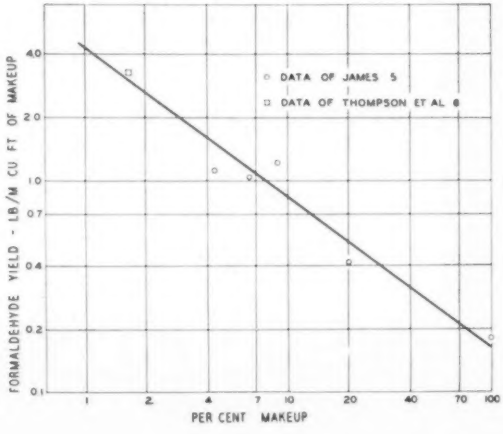
(Continued on page 114)

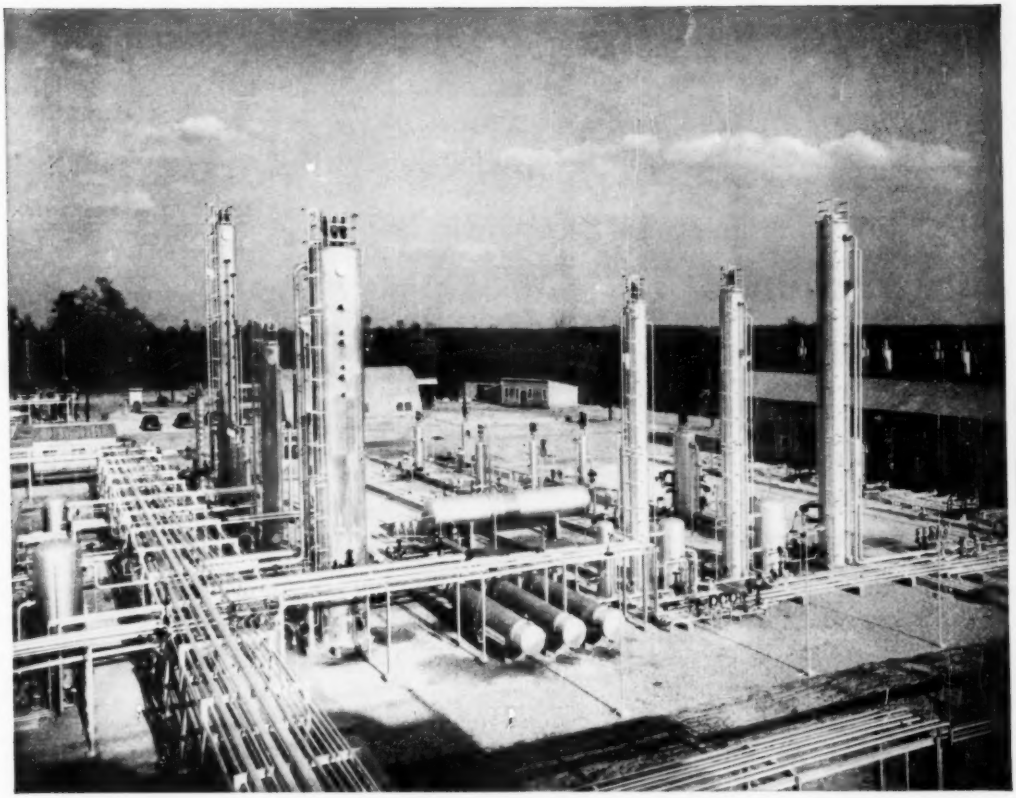
TABLE 1—EFFECT OF PRESSURE

	Pressure		Per cent
	Atmospheric	250 psig.	increase
Pounds of HCHO M cu. ft. of make-up gas	1.22	2.46	102
Carbon converted to HCHO (mol. per cent)	1.06	2.08	96
Carbon converted to CO_2 (mol. per cent)	2.80	4.35	56
Carbon converted to CO (mol. per cent)	4.00	7.25	81

Fig. 2A—(Left) Effect of per cent makeup on formaldehyde yield. Fig. 3—(Right) Effect of per cent makeup on makeup rate and formaldehyde production rate







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Natural Gas Supplies Heat To Variety of Industries

. . . Piping Fabrication a Typical Example

by Arthur Q. Smith*

WITH natural gas supplying heat for processing, annealing, and many applications in both light and heavy industry, a type of illustration is the special furnaces and heating equipment for the manufacture of fabricated piping material for high-pressure steam and power stations, piping for oil and gas wells, and other uses for which there are no standard parts. The special furnaces and heating equipment described here are those of the Midwest Piping & Supply Co., Inc., St. Louis. They are fired exclusively by gas, which is a factor in the over-all efficiency and economy of operations of this kind.

One of the heating units which is versatile and performs many operations is the small Van Stone gas-fired furnace, designed to heat the ends of pipe for flanging and various small items. It operates at 1,800° to 2,000° F. Each furnace has five burners equally spaced around the heating chamber. These are connected to a continuous manifold, in turn connected to a single inspirator using 970-B.t.u. gas at 25 psi. pressure. These furances are portable to the extent they can be moved around convenient to the work.

There are eight gas-fired forge furnaces used to heat steel for parts fabrication under hammers or forming presses, They are all of the hearth type, being over and under fired by high-pressure inspirator tunnel burners manually controlled.

Another furnace designed by Midwest is unique in that it is readily adjustable as to length of the heating area and is used to heat pipe for bending. It is 16 ft. long, with an arch made up of 10 doors, or covers, which swing upward permitting the loading of the furnace by overhead crane. There are 15 inspirator burners along one side of the furnace using gas at 5 to 10 psi. pressure developing a furnace temperature of 2,000° F. Pipe up to 30 in. in diameter can be heated to 1,800° F. for bending on the table.

A new annealing furnace has recently been put into operation. The design of this furnace permits a wide range of flexibility as to temperatures and time cycles to meet requirements for a finished product of proper metallurgical characteristics. This new direct gas-fired car-bottom annealing furnace is 35 ft. long, 10 ft. wide, and 9 ft. high with a capacity of 40,000 lb. of fabricated material. There are five heating zones, each 7 ft. long with eight burners to a zone, four on each side. The lower burners fire below the car bottom and the upper burners fire over against the arch. The burners are low-pressure nozzle mixing with a mixing valve and zero governor on each burner. Full automatic temperature control together with program control is installed and, when operating, there is a minimum of temperature variation.

The furnace has proved to be most successful from all angles. A variety of work is done in it by different heating plans. Some items are best treated by ordinary batch methods, other items are treated under a predetermined "program controlled" cycle. The instruments are preset for a definite heating-up time, then a soaking time followed by a quench or cooling period depending on the exact type of steel being processed and the results required. Operating data show the program controlled method of annealing to be most economical in gas consumption. Three cycles are used as an illustration and give the hourly cost of 970-B.t.u. natural gas for this operation.

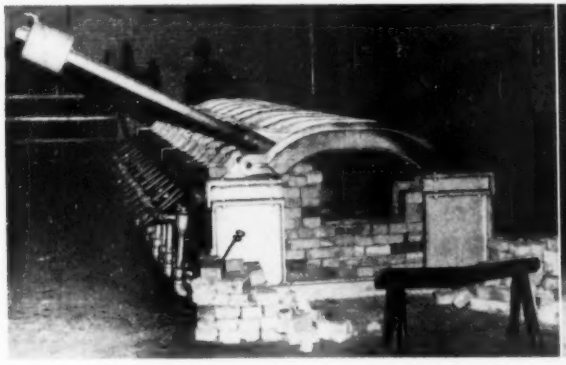
1. **Eight-hour cycle**
   Heating time ..... 5 hours
   Soaking time ..... 2 hours
   Cooling time ..... 1 hour
   Cost, $1.44 per hour or 0.07 cent per pound of charge.
2. **Eighteen-hour cycle**
   Heating time ..... 6 hours
   Soaking time ..... 2 hours
   Cooling time ..... 10 hours
   Cost, $1.26 per hour or 0.15 cent per pound of charge.
2. **Eleven-hour cycle**
   Heating time ..... 10 hours
   Soaking time ..... 1 hour
   Cooling time ..... zero
   Cost $3.40 per hour or 0.25 cent per pound of charge.

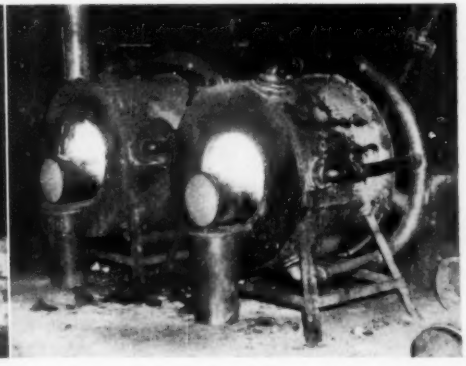
Other uses of the furnace are just as economical as the above. Based on a 15,000-lb. load, annealing can be done at 1,350° F. then air cooled with gas consumption at 37,000 cu. ft. At 1,700° with program controlled quench of not more than 50° per hour, gas consumption is 74,000 cu. ft. When 2,000° F. is required, 120,000 cu. ft. of gas is used.

Approximately 75 per cent of the work is with carbon steels at an annealing temperature of 1,350° F., stainless steels up to 2,000° F., and chrome steels around 1,550° F. with a plus or minus of 25°. Further studies by the company indicate that the use of gas fuel exclusively for all their operations where heating is involved has resulted in many over-all economies, higher production efficiency, and top-quality work.

*Industrial and Commercial Gas Section, American Gas Association, 420 Lexington Avenue, New York.

Left: This pipe-bending furnace has sectionalized arches which can be opened or closed to suit the length of pipe sections to be heated. The inspirators to the burners are shown along the left side. Right: Van Stone portable gas-fired furnaces used principally to heat pipe ends to be flanged. Temperatures up to 2,000° F. are obtained from the five burners set around the furnace





Use of Liquefied Petroleum Gas for Peak Loads

by A. B. Lauderbaugh*

THE use of liquefied petroleum gas as a standby fuel, or to meet winter-time peak loads, is no longer in the experimental stage. Millions of gallons of propane have been used as a substitute for natural or manufactured gas.

Many of the first propane-air plants erected on natural-gas systems were constructed as insurance against failure of the natural-gas supply. Particularly is this true of those plants built and operated by industrial users of natural gas. In their case, the cost of construction and operation of the propane-air plant had to be justified by the losses sustained through shutdown when their supply of natural gas was curtailed.

Just how much of the peak load of any natural-gas company can be furnished by propane-air, is determined by the physical structure of the property, and individual load characteristics of the company, and the purchase and sales rates for natural gas. It is a generally accepted opinion that most natural-gas companies cannot afford to make more than 2 per cent of their total annual sales in propane-air gas. There are, of course, notable exceptions to this general statement, and every contemplated installation must be given individual consideration, but for most companies, 2 per cent will still be the top limiting figure.

Expensive Substitute

Since propane-air gas is expensive as a substitute for natural gas some of its advantages for use in reasonable quantities should be considered. First of all, it is interchangeable with natural or manufactured gas in any proportion, including 100 per cent substitution. It can be delivered at any pressure up to about 125 psig. during 100 per cent replacement, and up to 350 psig. if it is mixed about 50-50 with natural gas. Therefore, the plant or plants can be placed almost anywhere in a distribution system and be designed to match the pressure on the pipe line at that location.

A propane-air plant can be placed close to the point of demand, and thereby help to solve the ton-mile transportation problem on the peak days when pipe-line facilities may be extended to their limit. Unlike some other types of "peak shaving" plants, a propane-air plant can be started up and shut down quickly, making it ideal for use on the peak hours of a number of days during the winter. Its ratio of effective output volume to storage volume is about 700 to 1, i.e., that for every cubic foot of liquid in storage, there will be more than 500 cu. ft. of plant output gas, and this output gas will replace or be equivalent to 700 cu. ft. of 1,100-B.t.u. natural gas.

Propane-air plants can be constructed to have almost any desired maximum send-out capacity from less than half a million to more than 50 million a day. Even more important is the fact that regardless of the maximum rate of the plant, it can be designed to have a satisfactory, stepless "turn down" of at least 10 to 1. In other words, a plant designed to have a maximum operating rate of say 5 million cubic feet per day, can be operated to send out any volume between 5 million a day and half a million per day.

Estimating Installed Cost

The installed cost of storage equipment for a propane-air plant is usually not difficult to estimate. The total installed cost for a propane storage tank having 30,000 gal. water capacity, including everything associated with the tanks will vary between $11,000 per tank for a 10-tank installation, and $9,000 per tank for a 30-tank installation.

Estimating the cost of the plant itself is not quite so easy. Two plants, having exactly the same maximum daily capacity, will vary in costs according to operating pressures. Obviously, all other factors being equal, the two plants cannot be constructed for the same cost. At some locations waste heat may be available for vaporizing the propane, at others it is necessary to install boilers for the operation. Again, the construction cost of the two plants will vary. For general estimating purposes it is more satisfactory to use cost figures for an idealized plant and location.

The following tabulation of plant costs, for various maximum capacities, is for such an idealized plant location. It is an average good location, just outside a third or second-class city and provided with a railroad siding for at least six flat cars. The site is clear and level. Soil bearing is 2,000 lb. per square foot minimum at foundation level. No electric, water, or steam services are available. The required discharge pressure of the plant is 75 psig. (the maximum that can be developed single stage).

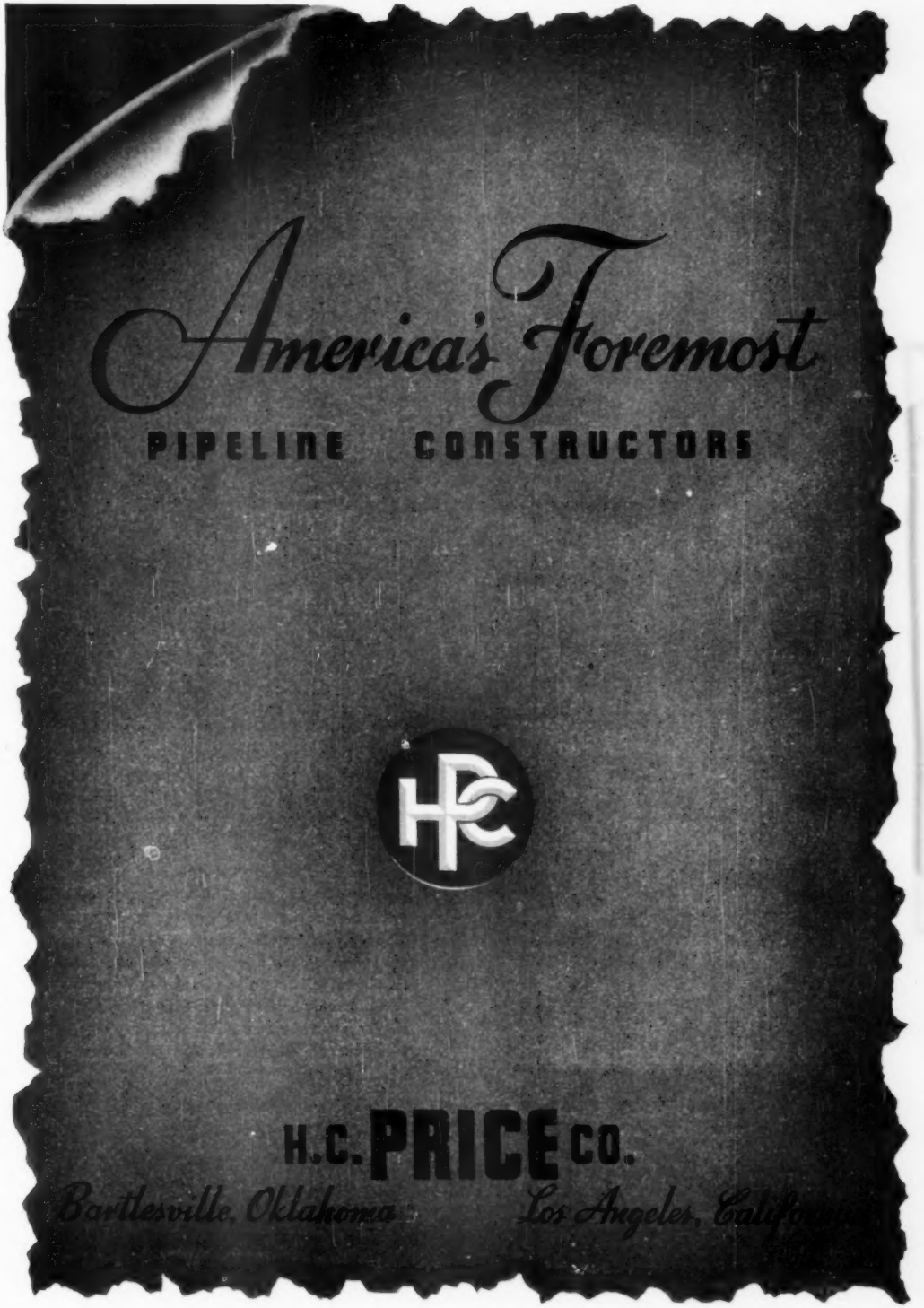
Max. daily plant capacity in equivalent M.c.f. of natural gas	Estimated plant cost without storage	Estimated storage cost for 6-day supply
3	$75,000	$85,000
5	$112,000	$132,000
7	$145,000	$170,000
10	$195,000	$230,000
15	$272,000	$320,000
20	$353,000	$415,000

Regardless of size, these idealized plants will, on the average, cost about 85 per cent as much as the installed cost of the storage tanks necessary for a 6-day supply for the given plant capacity. These figures are not suitable for contract purposes; however, they may be used for preliminary planning. To develop such preliminary figures for any capacity plant it is only necessary to remember three items: first, the $9,000 to $11,000 cost of standard storage tanks; second, that 2½ million cubic feet of equivalent natural gas can be stored in each tank; and third, that 85 per cent of the cost of the necessary storage for 6 days' operation will be the approximate cost of the rest of the plant.

In general, propane-air plants should have a long life and a low depreciation charge. The current total cost of propane-air gas delivered into the natural-gas line, on the peak day, and against a pressure of 75 psig. is about $1.40 per M.c.f. of equivalent natural gas. Of this amount $1.10 is the cost of the propane, and $0.30 is direct operating cost. When used to "shave" peaks, and with a demand-commodity rate, a plant may pay for itself in 3 to 5 years.

For example, suppose it was determined that peak demand, for which the charge is $2 per M.c.f. per month, could be lowered by 10 M.M.c.f. through the use of a propane-air plant having a maximum daily capacity of 10 M.M.c.f., and operating at various rates up to 10 M.M.c.f. per day for a total of 20 days, during which time it would replace a total of 80 M.M.c.f. of natural gas. By the methods mentioned earlier, the total number of tanks required to store a full winter supply for this plant would be 32, at a total installed cost of approximately $278,000. The 10-M.M.c.f. - per - day plant, to go with this storage, will, by the estimating method given before, cost about $190,000. The total estimated cost of plant and storage is then $468,000. Reducing peak demand by 10 M.M.c.f. will produce a gross reduction in the annual demand charge of $240,000. But at a total production cost of $1.40 per M.c.f. for the equivalent propane-air gas, it will cost $112,000 to save the $240,000, and the net saving will be $128,000. With an estimated total plant cost of $468,000, this rate of saving will pay for the plant in about 3⅔ years.

*Chief engineer, Manufacturers Light & Heat Co., Pittsburgh. Portion of a paper presented at the spring meeting, Natural Gas Department, American Gas Association, French Lick Ind., May 10, 1949.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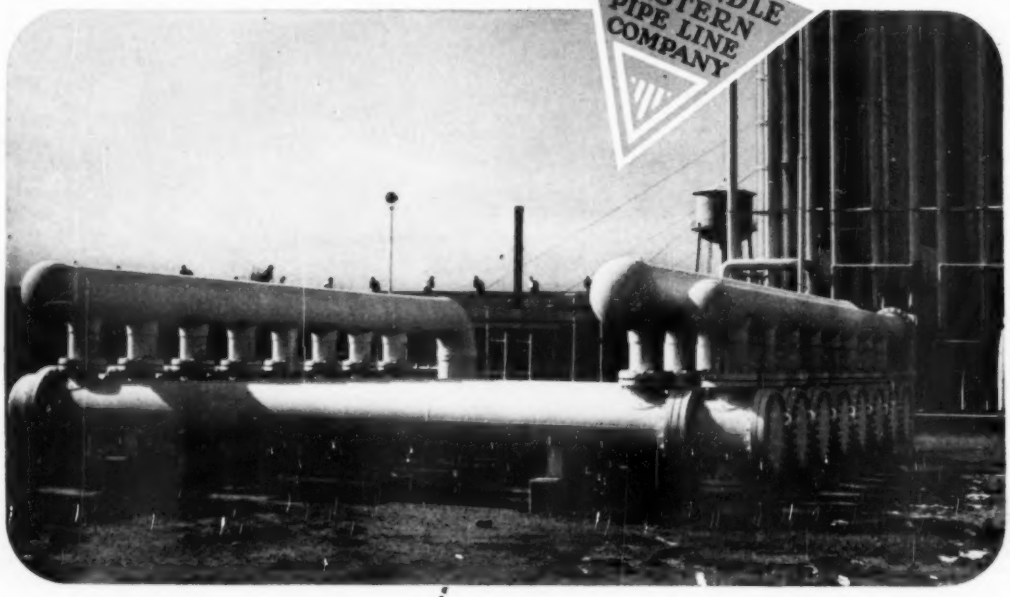

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Modern Gas-Pipe-Line Construction

. . . including brief comments on specifications and inspection

by Frank E. Richardson*

GAS-PIPE-LINE construction as we know it today began in the 1920's when the gas industry saw the necessity of transporting natural gas from Middle Western reserves to established markets. This gave birth to the long-line transportation of gas, just as the need some years earlier gave birth to the long-line transportation of oil. To transport gas great distances, however, required the development of material and equipment that would safely and economically use their capacity, to deliver greater volumes of gas for given sizes of line than ever before. This was the reason for the development in 1926 of large-diameter thin-wall pipe of longer lengths and of more uniform wall thickness and with a manufacturing control that permitted higher pressures for the same wall thickness.

The use of large-diameter thin-wall pipe in the beginning gave pipe-line engineers considerable worry, for tests showed that ordinary pipe-bending methods would not make a satisfactory bend. To overcome this lack of construction technique, factory bends were furnished the contractors in the field and the pipe-line ditch was profiled and located so that each bend and turn in the line could be predicted ahead of the pipe-laying crew. This new method of pipe-line laying in itself was difficult, and in the minds of some engineers it prevented the full use of a solid welded line, because the grading of the pipe line made long runs of straight pipe, that accumulated the thermal expansion and contraction to a degree that they thought might be excessive. Some designers therefore required the pipe line to have as a jointing medium the slip-type coupling every second joint and later every fourth to fifth joint.

Pipe-line engineers soon found that the slip joint was the weakest point along the pipe line and because of this there was developed a solid welded joint that would take care of the expansion or contraction. This joint made use of the bellows or corrugated principle in its construction and allowed some changes in the direction of the pipe line without the use of factory bends. Contractors, however, soon developed new methods of bending the line pipe in the field, first by the use of portable heating equipment that permitted "fire" bending, and later the wrinkle bending which on some gas-line construction is used today.

Wrinkle bending of thin-wall pipe has stood the test of time and in a pipe line that maintains its flow efficiency, without frequent cleaning, it can be assumed to be good practice; however, with the use of large-diameter thin-wall pipe in oil-pipe-line systems, that require frequent running of scrapers, it is not considered good design.

The first use of large-diameter thin-wall pipe in oil pipe lines was the War Emergency Lines built in 1942 and 1943, and the need for full-diameter smooth bends throughout the entire arc of the bend caused the development of a bending machine, which to promote its use was furnished to the contractors by the WEP. This type of machine has been improved to a degree where it can be predicted that all diameters of pipe of presently known physical and chemical characteristics and with a wall thickness that can be hauled, strung, and welded, can be bent to fit the "lay of the land."

Steps in Development

The foregoing discussion covers many years of development in pipe lining but fails to record the other changes that took place in the construction methods of pipe lines. Notable among these are the changes in the pipe-joining methods from the threaded coupling and slip joints to acetylene welding and later to the shielded electric-arc welding. The changes that contributed largely to the development in the art of pipe-line construction, to the high degree of efficiency that it is today in chronological order are:

1916—Acetylene welding of pipe-line joints was used first on a 9-mile 10-in. line from Drumright to Cushing, Okla.

1926—Large-diameter seamless pipe was made available for pipe lines.

1927—Electric welded pipe was made available in large diameters and with thin walls for use on pipe lines.

1928—The first electric welding was done using bare rod on a short oil line into Corsicana, Tex. The type of joint was bell and spigot. **Aerial photographs** in pipe-line location. The first known use of this method was employed on a pipe line from Yates pool to Port Arthur, Tex.

1929—Electric welding with bell-and-spigot pipe joint was further used on a long-distance oil line into Chicago. The experience on this line was not satisfactory as it had 45 breaks in the electric welds the first year.

1930—Coated electric welding rod made its appearance and was used experimentally on 32 miles of 20-in. gas line in Kansas. **Acetylene welding** for pipe joints by a new method was placed in wide usage.

1933—Electric welded joint without a backup ring. **Stove-pipe method** of pipe-line construction used on a line near Turnertown, Tex., pointing the way to present technique of "stove piping."

1934—Three-flame oxyacetylene tip for speeding up welding with acetylene comparable to that employing the electric arc.

1935—The rooter plow which extended the utility of the ditching machine into areas previously requiring blasting.

1936—Dewatering method of excavation for river crossings first used on a gas pipe line in western Kansas. **Use of the stove-pipe** method extended in pipe-line construction. Used on 49 miles of 10-in. in eastern Kansas and 93 miles of 12-in. in West Virginia.

1937—Four-flame oxyacetylene tip for "position" welding using low-alloy rod. **Six-flame oxyacetylene tip** for "rolling" weld also made available this year.

1941—Pressure welding first used on 2 miles of 6⅝-in. pipe line near Tucson, Ariz.

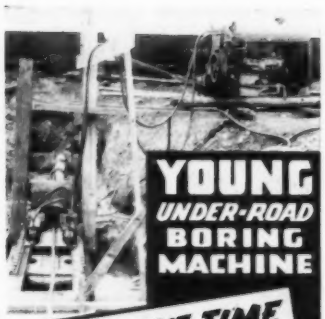
1942—Double-coat, double-wrap machine for protective coatings on pipe lines first used on an 8-10-in. crude line built to Port Arthur, Tex.

1943—Cold-bending machine for large-diameter pipe developed and used on part of the 24-in. War Emergency crude line and all of the 20-in. products line.

1944—Dewatering of crude-oil pipe-line river crossing used on a 16-in. crude-oil line from West Texas to Oklahoma.

1945—Internal line-up clamp made available for use in the pipe-line industry.

*Consulting engineer, Texas Eastern Transmission Corp., Shreveport. Paper presented at the spring meeting, Natural Gas Department, American Gas Association, French Lick, Ind., May 9-10.



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1946—X-ray of welds first used on an 18-in. pipe line in California. **Large-diameter pipe** made available for pipe-line construction by the submerged electric-arc process. This was for a California 30-in. gas line.

1948 — Hydraulic bending machine which is indicated experimentally to be capable of making a smooth bend in large-diameter thin-wall pipe.

Practically all-gas line companies are contracting for the construction of their pipe-line projects on a competitive-bid basis. Except for the period of the war, all pipe-line work has been done on a competitive basis with a firm fixed price for either the units of work or a turnkey price for the entire job.

For convenience most corresponding construction contracts and specifications are divided into sections or items corresponding to the operations involved in the construction of the line. Short comment on the provisions of the specifications covering large-diameter pipe-line construction and the construction equipment used in each operation is given in the following:

1. **Clearing of right-of-way.**—This item specifies what is required in the way of clearing the land and designates a right-of-way width that will be furnished the contractor free of all damage claim. Specifications usually indicate how to dispose of the brush and timber cut from the right-of-way, and in some cases requires timber of certain sizes to be cut in merchantable lengths for disposition by the company.

The conventional tools used in clearing right-of-way consist of hand-operated and power-operated saws; however, in lightly timbered areas most of the clearing may be done by bulldozers. Temporary fencing is also covered in this part of the specifications, and instructions are set out as to the grading of the right-of-way on the approaches to all rivers, creeks, and draws.

2. **Unloading, stringing, and hauling.**—Under this item are outlined instruction to the contractor regarding the necessity for complying with state and federal regulations for travel over highways. The contractor is requested to furnish the company with evidence that licenses and permits covering the travel of contractor equipment over highways have been obtained. This section of the specifications dictates the manner in which materials are to be unloaded and indicates the responsibility for claims for losses due to delivery of pipe and materials not caused by negligence of the company. This specification section also indicates the liability of the contractor for the racking of pipe and the storage of materials, together with the inspection necessary on the receipt of all materials furnished by the company; instructions also as to the hauling and stringing are given at some length, particularly where there is a probability of damage to pipe or materials by the contractor.

In the matter of stringing the pipe, the contractor is instructed under this section as to the need of the landowner for crossings of the right-of-way to facilitate the movement of farm equipment or stock. Instructions are also given as to the handling of coated pipe, if coated pipe is furnished by the company. Equipment in this class of the work consists of cranes, gin trucks, hauling trucks and tractors, Athey wagons, mud boats, tractors with winches for towing, and tractors with side booms for unloading trucks on the right-of-way.

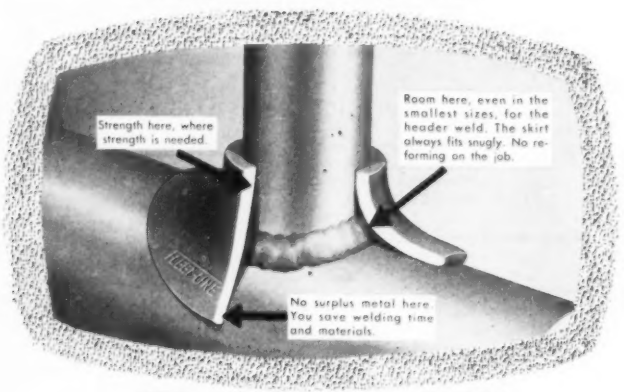
3. **Welding.**—The welding of a large-diameter long line is mainly done by the electric-arc process. Three or four beads or passes are made before the completed weld is acceptable and specifications as a rule indicate the size and specifications of the rod that is to be used for each bead or pass. There is also a recommendation as to the amperage to be carried at the welding generator. Certain qualification procedures for the welders are set out in the specifications and very complete instructions are given as to the size of the weld, the cleaning of the weld between passes, and the probable inspection of the weld after it is completed.

Electric welding equipment consists of welding machines, gasoline or diesel-motor driven, and the means of transporting them along the right-of-way. In recent years there has been developed a technique for joining pipe called pressure welding that received favorable comment. In this operation a tractor is used for lining up the pipe to be jointed and another tractor is used for manipulating the pressure welding equipment. Heat is applied to the ends of the pipe to be jointed, by an oxyacetylene flame placed continuously around the pipe ends that have been beveled in a very steep bevel at the mill. The oxyacetylene flame heats the tips of the pipe to above welding temperature, and a force of approximately 4,000 lb. is applied to both ends of the pipe, compressing them in a manner so as to upset and forge the ends together. After 1½ minutes of applying the 4,000-lb. force, an additional force up to 16,000 lb. is applied to complete the joint. With this method the tolerances permitted the manufacturers of pipe were too great to allow the thin-wall pipe perfectly to align itself at the ends and caused lapping both inside and outside; however, it is thought that as manufacturers are able to improve their product in the matter of physical dimensions, this method of joining will again be put to use, and a more uniform joint may be obtained.

4. **Ditching.**—Specifications provide for a depth of ditch sufficient to cover the pipe to a minimum depth of 24 or 30 in., this

BETTER SADDLES

FLEET-LINE


Strength here, where strength is needed.
Room here, even in the smallest sizes, for the header weld. The skirt always fits snugly. No reforming on the job.
No surplus metal here. You save welding time and materials.

ASTM A234

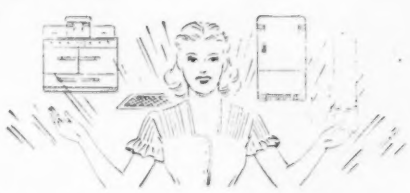
WRITE FOR BULLETIN

STEEL FORGINGS, INC.

P. O. BOX 276-B • FOOT OF FANNIN • SHREVEPORT, LA.

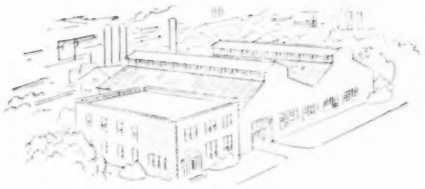
THE STORY OF NATURAL GAS IN OKLAHOMA!

Located in the heart of the Magic Circle, Oklahoma's "a natural" for industry! It boasts an abundance of raw materials. Its native labor is intelligent. Transportation is quick and dependable. Living conditions are excellent. And there's plenty of room for expansion in this enterprising and forward-looking state where people think and act progressively!



Yes, it's a great state! And because Oklahoma offers all this and Natural Gas, too, it has enjoyed a rapid growth in its 42 years of statehood.

Since the story of Natural Gas is the story of Oklahoma, we're not only *watching* Oklahoma's growth — we're *participating* in it! Thanks to Oklahoma Natural's underground storages and expanded transmission and distribution systems, commercial, industrial and domestic customers in over 100 Oklahoma communities are assured a year 'round supply of low-cost, dependable Natural Gas!



OKLAHOMA NATURAL
Gas Company

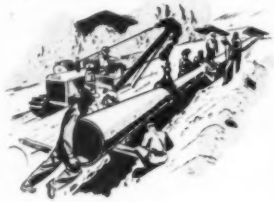
The Columbia Gas System in 1948

served *More People* with *More Gas* than ever before

The Columbia Gas System is a completely interconnected, interdependent network of facilities for the

Production

Transportation



and Distribution

of Natural Gas

Natural gas, delivered through public service facilities, is one of the most potent forces in the economic development of the American Community.

For more than a quarter century, natural gas —delivered in ever-increasing volumes by Columbia System companies—has been an impelling influence in the development of industrial leadership, domestic comfort and convenience in the Heartland of America—the mid-Appalachian areas in Ohio, Pennsylvania, New York, Virginia, West Virginia, Kentucky and Maryland.

Today, with the demand for natural gas still unsatisfied, the Columbia Gas System is building new facilities for an even greater public service.

THE COLUMBIA GAS SYSTEM

comprised of

The Columbia Gas System, Inc. — Columbia Engineering Corporation (the service company) — The Manufacturers Light and Heat Company — The Ohio Fuel Gas Company
United Fuel Gas Company — Atlantic Seaboard Corporation — Amere Gas Utilities Company — Virginia Gas Distribution Corporation
Virginia Gas Transmission Corporation — Big Marsh Oil Company — Central Kentucky Natural Gas Company — Binghamton Gas Works
Cumberland and Allegheny Gas Company — Eastern Pipe Line Company — Home Gas Company — The Keystone Gas Company, Inc.
Natural Gas Company of West Virginia — The Preston Oil Company — Union Gasoline & Oil Corporation — Virginian Gasoline & Oil Company

measurement to be from the top of pipe to the average level of the original ground and of a width usually 12 to 16 in. wider than the outside diameter of the pipe. Ditching is so conducted that a minimum number of overbends and sag bends is required.

This section of the specifications also includes instructions to the contractor for ditching through irrigated and drained lands and also for boring or punching holes under highways and railroads in which can be placed conductor pipe. The approaches that might be necessary for certain creek, river, and ravine crossings are also covered and a warning is always given as to the need for care when the new pipe line being built parallels older pipe lines in close proximity to the new line. Ditching through populated areas and along streets where certain rules and specifications of the city, township, county, or state may apply, too, are a part of this section.

Wheel-type ditchers are still the principal means by which a pipe-line ditch is cut. Under some conditions draglines and back hoes are used for cutting the ditch. Rooters are used under special conditions, and in some formations of dirt, slopers are used in connection with the ditching machine. On occasion one or more pieces of the above equipment are used before drilling and shooting the rock with dynamite; however, where hard rock is found it is often necessary to use air compressors and jack hammers. In recent years contractors have found that wagon drills will speed up the drilling of the rock and allow more economical use of dynamite.

5. **Pipe protection.**—Specifications on this item in the contract cover at great length the cleaning of pipe when the pipe is furnished bare, and stress the importance of the condition of the primer at the time the enamel is first applied. The temperatures of the enamel at the time of application are carefully stated and the manner of maintaining the heat in the kettles melting the enamel is very carefully stated. Also covered are the handling of protected pipe, the condition of the ditch before placing pipe in the ditch, the inspection of the coating after placement on the pipe, and the backfill that is to be placed immediately over the pipe in the ditch. The handling of glass fiber and asbestos felt is included, too.

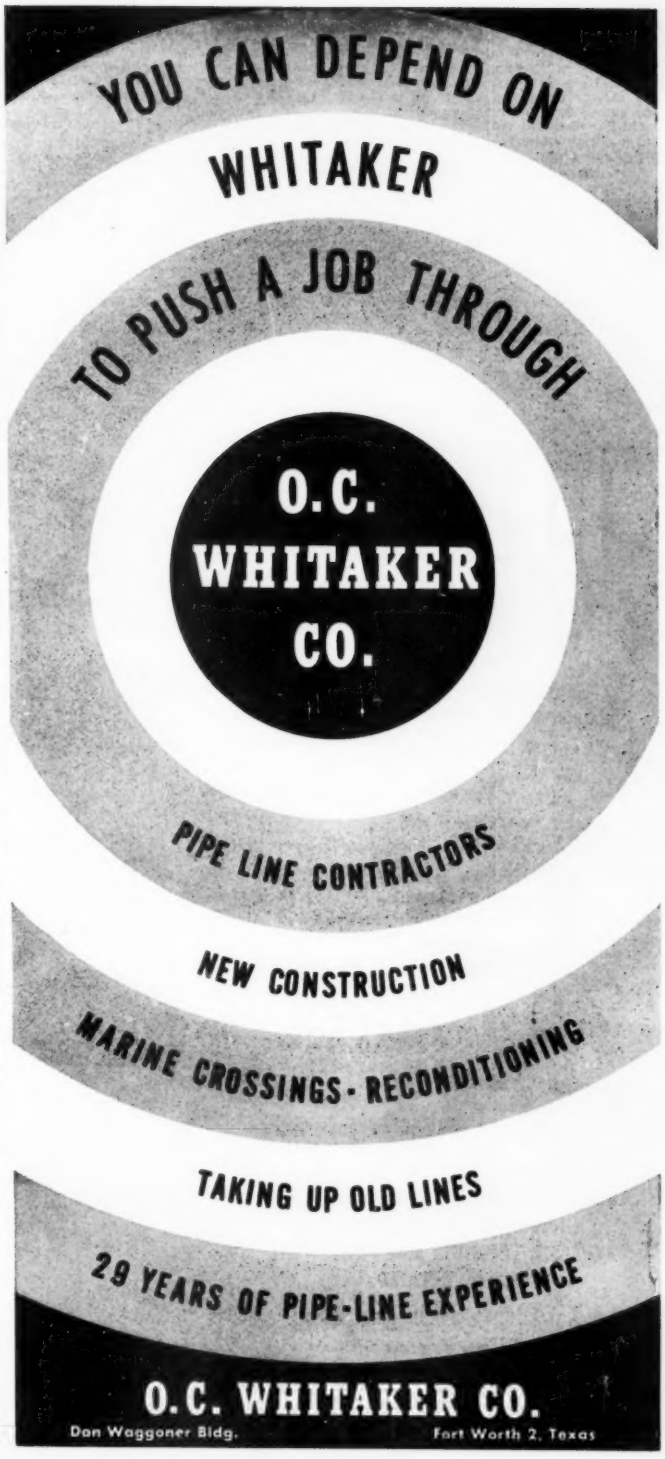
In this class of work the contractor may have numerous special machines such as cleaning and priming machines, enameling and wrapping machines, paint kettles of various capacity, together with tractors for placing the pipe in position for the cleaning and priming machine, the enameling and wrapping machine, and for moving the kettles along the right-of-way.

6. **Laying.**—The specifications on practically all pipe-line jobs now prohibit miter welds or bending by heating; the first by reason of its inability to withstand expansion and contraction stresses, and the second by reason of its lowering the physical properties of the pipe which have been developed in the manufacture of the pipe by cold working.

Specifications emphasize the lowering in of the pipe into the ditch in such a manner as to provide the maximum amount of slack and to prevent damage to the protective coating. It is required that all sag bends fit the ditch perfectly and that there be space between the bottom of the ditch and the underside of the pipe at all overbends.

All laying-operation specifications cover details as to the placement of the main-line pipe in conductor pipe under railroad and highways and under other pipe lines and across streams or canals.

7. **Back filling.**—The specifications on this operation cover the disposal of excess backfill material and the care that should be taken in placing the backfill over the ditch. They also provide for materials that are to be placed adjacent to the coated pipe and the kind of backfill materials that remain on the top of the backfill, particularly through cultivated lands where rock may have been excavated in the ditching operation. These specifications also cover the need for riprapping and the diversion of



water courses that parallel the pipe-line ditch.

Back-filling operations follow closely the laying operations and are usually performed by a fewer number of men than any other part of the construction forces. The equipment used is either a bucket-type backfiller mounted on a crawler-type tractor, or a dragline, or a tractor equipped with angle dozer.

8. **Testing.**—The specifications covering this work give the requirements concerning any special sections of pipe that may have been connected for stream and highway crossings and give the total requirements for any completed sections of the main pipe line. They advise the contractor as to what equipment he is to furnish to test the pipe line, and his responsibility for repairs, if repairs are necessary, after the testing of the line. The contractor is also instructed as to the running of scrapers, and his liabilities for maintenance that might be necessary due to improper workmanship or materials which he may furnish.

9. **Clean up.**—Most specifications require that the pipe line right-of-way be returned as nearly as possible to its original condition and cover the liability of the contractor in the matter concerning disposal of any brush, trees, and other items that are to be burned or hauled away.

Under this specification, repairs to fences and replacement of any fence posts are detailed; also repairs to bridges, culverts, and highways are indicated. The disposal of excess materials is also indicated and the acceptance of the job after construction is explained at quite some length.

The clean-up specifications nearly always provide a statement as to the need of "good will" of the property owners along the route of the company's line and request that the contractor, in his clean up of the line and his repair to fences, do everything possible to create a good impression on property owners. Contractors usually provide in the clean-up operation angle dozers, fence tools, and in some cases graders and tractors with drags so as to leave the right-of-way as free from evidence of pipe-line construction as possible.

10. **Special work.**—In addition to the operations or classes of work indicated above, the topography and the culture of the country over which the pipe line is constructed dictate the need for special methods and special equipment. This is particularly true where pipe line traverses swamps and lakes where floating equipment may be necessary; however, these all require equipment and methods typical of the particular location.

In the laying of pipe lines across large rivers, pipe-line bridges may be necessary and in other cases "well pointing" may be specified and both of these require the services of men skilled in this particular type of work. Specifications covering this class of work are as a rule separate and cover the exact conditions that are to be encountered at a particular location.

Inspection

Some companies have a policy of selecting inspectors from the personnel that will be used in the operation of the pipe line under construction. Obviously the reason is that these men have the interest of the company in mind more than those selected outside the organization; however, in some cases these inspectors are inexperienced and may lack good judgment in the matter of recognizing sound construction practices.

In choosing an inspector for any one of the pipe-line-construction operations it is important that the person chosen be familiar with as many of the other operations as is possible, with the probable exception of welding. As a rule welding is a separate skill and only men with wide experience in the actual welding of a pipe line can satisfactorily inspect such operations. However, the development made in X-ray during the war for inspecting pipe-line welding is of great assistance to the inspector. In X-ray inspection welds can be photographed so as to show such flaws as burned-through areas, lack of penetration, undercuts, misalignment of pipe ends, slag inclusions, and the like.

Future Trends

Future trends in gas-pipe-line construction and transmission are indicated in the fact that nearly 20,000 miles of additional natural-gas lines are being laid, authorized, or proposed. Most of these new lines are of large diameter with capacities much greater than those of only a few years back.

The steel required for these new gas lines is in the order of 3,700,000 tons which indicates an equivalent pipe diameter of 24 in. for every mile planned. This program would require at least 400 schedules of work and approximately 978 million dollars will be spent for the pipe and its installation. The contract portion of this represents an outlay of 285 million dollars and approximately 62 million man-hours of work.

It safely can be predicted that future jobs will see more use of two-way portable radio, more use of power equipment in right-of-way operations such as power saws, post-hole diggers, and faster and larger ditching machines. More use is also seen for two-stage ditching; smooth, cold field bending; self-propelled electric generators, air compressors and tar kettles. The internal lineup clamp; X-ray for inspection of field welded joints; the airplane and generally more mechanized equipment handled by more highly trained men, too will be put to wider use.

The future will see the introduction of higher-strength pipe having approximately the same chemical characteristics as the pipe used today and the full use of pipe-protection materials that will reduce corrosion. Automatic welding of pipe-line joints, automatic shutoff devices to save pipe-line contents and main-line valves opening to the full diameter of the pipe on which they are installed that can be quickly opened or closed also are seen for wider future use.

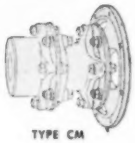
THOMAS ALL METAL Flexible COUPLINGS

SPECIFIED WHEREVER 100% DEPENDABILITY IS DEMANDED

Refiners specify Thomas "Flexible" Couplings for PUMPS, COMPRESSORS, COAL PULVERIZERS, COOLING TOWERS and GENERATOR SETS.

TYPE DBZ-C

Pipe Line Men know that Thomas "Flexible" Couplings on their Low or High Speed Pumps give 100% dependable service.



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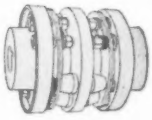
Drilling Engineers get the most out of their equipment with Thomas "Flexible" Couplings on Engine, Gear and Mud Pump Drives.



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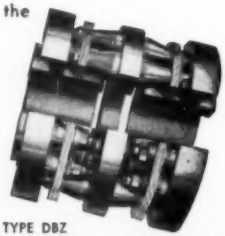
In the Laboratory Thomas "Flexible" Dynamometer Couplings assure the greatest accuracy.



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Thomas Flexible All-Metal Couplings Have No Wearing Parts. BACKLASH, FRICTION and CROSS-PULL ARE ELIMINATED.

NO LUBRICATION IS REQUIRED!

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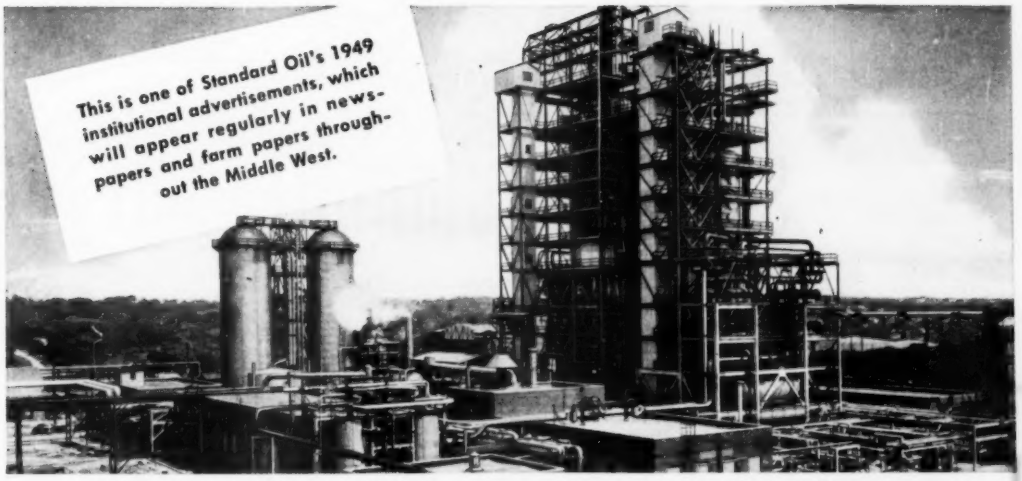

This is one of Standard Oil's 1949 institutional advertisements, which will appear regularly in newspapers and farm papers throughout the Middle West.

This great new "cat cracker" was completed last year at our Sugar Creek, Missouri, refinery. It is one of the important pieces of new equipment for which we spent, all told, more than $630,000,000 in the period 1946-48. For our customers, equipment like this means more high quality petroleum products. For our employees, it means jobs, earnings, security.

Again... in 1949

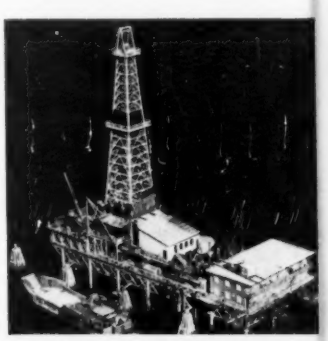
A REPORT TO OUR NEIGHBORS

How Standard Oil helped bring you more oil—how our 48,000 employees and 97,000 owners teamed up to set new records—where we stand today

WE KNOW that you have a definite interest in whether or not you can get all the petroleum products you need. That is why, for the past two years, Standard Oil has told you about the all-out effort of this company and its subsidiary companies to meet your huge, growing demand.

Now we are happy to report that, in spite of demand that continues to rise, you can get all the oil you want—gasoline, fuel oil, every petroleum product that a nation on wheels must have. This accomplishment was made possible through the hard work of the entire industry. In our case, Standard Oil drillers, transportation workers, refiners and marketers work together as a team in an integrated organization backed by the willingness of management and our 97,000 owners to spend more than twice our net earnings of the past three years for new facilities.

STANDARD OIL COMPANY (INDIANA)



MILES OFF SHORE in the Gulf of Mexico we're now getting oil from under the sea to help keep up with your demand. Last year Standard Oil drilled a total of 597 new oil wells. Although the cost of finding crude oil has increased about 300% in the last ten years, you now pay only 41% more for gasoline than you paid in 1939.

STANDARD EMPLOYEES, like Raymond J. Sabol of Whiting, Indiana, have behind each of them an average investment of $26,700 in tools and equipment. With the aid of this, our employees averaged over $4,400 in wages and benefits last year and broke all records for output of petroleum products for the third consecutive year.

MRS. MARCELLA M. SKINNER is one of the 97,000 owners of Standard Oil. No one man or woman owns so much as 1% of the stock, and no institution owns so much as 5%. Of our 1948 profits—the money left after all operating costs were paid—owners received 29%. The other 71% paid part of the cost of the new facilities we installed to serve you better.

O. H. JOHANSON and thousands of other Standard dealers have a dependable supply of high quality petroleum products for you. Customers have a right to be supplied, just as our employees have a right to fair compensation and our owners a right to a reasonable return on their investment. Our aim is to guard each of these rights, so that this business may live and grow.

PROSPECTING with the SURFACE MAGNETOMETER

by David E. Reed* and Erik U. Garpner*

MANY of the magnetic maps which today crowd the inactive files of independent and major companies alike, are based upon field surveys made two decades ago. Since all of the early-day magnetometers were of relatively low sensitivity, and one was compensated for temperature, it is not surprising to find those first maps discarded. Moreover, the original methods and techniques employed by both the field operators and the interpreters left much to be desired.

True, the most prominent magnetic features showed up very well on those early day maps, but the dry holes spotted here and there upon some of the larger magnetic "highs" are mute testimony of the poor interpretive reasoning then followed. This usually was that magnetic "highs" should be structural highs, and magnetic "lows" structural lows. Unfortunately, neither this approach, nor any other simply stated rule, can be applied to the structural interpretation of magnetic data, any more than it can to gravimetric data.

In order to describe any interpretive approach, it is first necessary to discuss briefly the general background of the magnetic method.

Fig. 1 (A) shows the well-known pattern of iron filings on a paper held over a bar magnet. We know that the earth itself acts as a large magnet. Fig. 1 (B) shows diagrammatically the direction and relative intensity of this total magnetic field for various points on the earth's surface.

In the United States, the dip of the total field ranges from 60° to 75° below the horizontal. The total intensity, "T," can be resolved into two components, one vertical, "V," and the other horizontal, "H." See Fig. 2. Only the vertical component is generally of interest in surface prospecting for oil, because, being stronger than the horizontal in the latitude of the United States, it is easier to measure and to interpret.

Fig. 2—Showing ratio of vertical to horizontal magnetic effect in makeup of total magnetic effect usually found in the United States

The final magnetic values computed from the field readings are placed on a base map in their correct geographic positions, and contoured. On the contoured map the local magnetic differences, or departures from normal, are shown as local highs and lows, called anomalies. These are caused by lateral variations in the magnetization, or polarization, of the rocks of the earth's crust down to a considerable depth.

Most sedimentary rocks, with some exceptions, have low magnetic properties. Igneous and metamorphic rocks usually have high magnetic properties, increasing from acid, such as granite, to basic types such as basalt, gabbro, etc.

Other Considerations

It is easily seen that local magnetic anomalies will exist in the case of an uplift of the basement complex, where the igneous rocks are offset laterally by sedimentaries. But as will be pointed out later, there are other things that have to be considered. Interpretations of early magnetic surveys failed, in too many cases, to give such consideration. The result was a questionable reputation for magnetic methods. The truth is that the method was all right, but the interpretation was poor.

An area of low magnetic relief usually indicates either: (1) a deep basement, or (2) one composed mainly of acid igneous rocks. An area of high magnetic relief suggests either: (1) a shallower basement, or (2) a basement composed of basic types of igneous rocks. Certain mathematical formulas have been worked out for estimating the depths from the surface to the basement of igneous rocks. These estimates are based mainly on the widths of the anomalies.

A structure in a pure sedimentary section would rarely bring about great enough lateral contrast in magnetic properties to create a magnetic anomaly measurable at the surface. For instance, a bioherm limestone reef in an area of monoclinal basement rocks will, unfortunately, not be reflected in magnetic measurements. For all practical purposes we can consider that the source of nearly

*Reed Magnetic Surveys, Tulsa

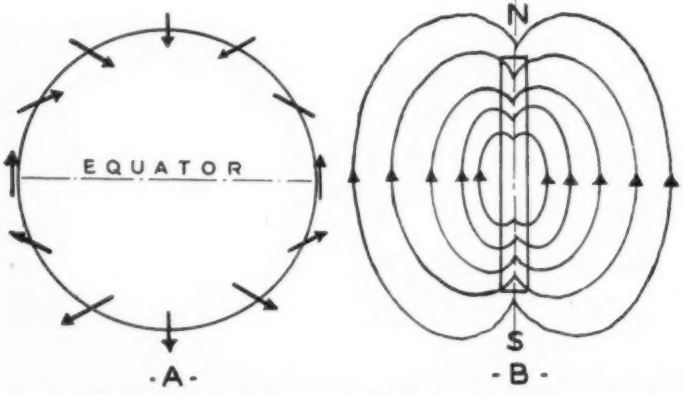


Fig. 1—Illustration of direction of earth's total magnetic field and comparison with pattern formed by loose iron filing when affected by a bar magnet

Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OUR 29th YEAR

4 HAZARDS

MAKE BAASH-ROSS DRILL COLLAR SLIPS "MUST" SAFETY PROTECTION

. . . And Every Drill Collar from 3" to 8¼" can have this vital protection!

Baash-Ross Drill Collar Slips—"Long" Type

FOUR HAZARDS make supporting a drill collar in the rotary table one of the riskiest of all rig operations . . .

. . . 1 *The constant change of drill collar diameter caused by wear and abrasion against the fresh-cut walls of the hole.*

. . . 2 *The usual flush design with no shoulders for stopping a slipping drill collar.*

. . . 3 *The drill collar's hard heat-treated surface that reduces gripping efficiency.*

and 4 *The relatively low drill string weight available for wedging the slips into the bowl.*

That's why safety-minded operators throughout the world have adopted Baash-Ross Drill Collar Slips as "must have" rig equipment, because these Slips are *specially designed* to overcome the risks of supporting a drill string in the rotary table. In contrast to the normal fixed-curvature design of rotary slips, the unique multi-segment design of Baash-Ross Drill Collar Slips permits them to w-r-a-p around the drill collar like a chain tong. They take a full slip-proof grip whether the drill collar is new or worn, round or out-of-round. *And they automatically compensate for as much as 1½" change in drill collar diameter — more than ample for modern drilling operations.*

For example, note in the table how a Baash-Ross Drill Collar Slip that fits a 7" diameter drill collar will also fit *any* diameter down to 5½". Adjustment for wear is automatic and continuous throughout the working range!

This means that Baash-Ross Drill Collar Slips automatically take a *full* grip on any drill collar within their range—a grip that gives adequate support to compensate for the continuous wear which changes drill collar diameters . . . for the hard heat-treated surface . . . and for the lack of drill string weight.

Sizes and Operating Ranges of Baash-Ross Drill Collar Slips

SIZE*	Operating Range	
	From	To
A	3"	4½"
B	3¾"	5¼"
C	4¼"	5¾"
D	5½"	7"
E	6¾"	8¼"

*(all sizes available in both "Regular" and "Long" types)

TWO TYPES

Baash-Ross Drill Collar Slips are available in two types —"Regular" and "Long." The "Long" type has extensions above the gripping area to provide a seat for the Baash-Ross Safety Clamp — the clamp that puts a non-slip, *yet removable,* "stop shoulder" on *any* drill collar to compensate for the hazards of flush design when supporting the collar in the table. For complete details see your nearest Baash-Ross representative — or write direct!

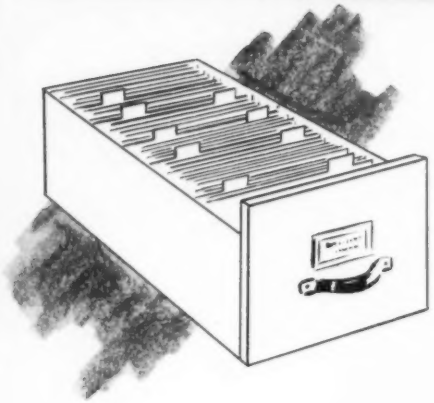
The "Why" of Baash-Ross Drill Collar Slips

ORDINARY SLIPS that fit the drill collar when new (A) are unable to adjust themselves to smaller diameters as the drill collar wears away. Result, grip becomes less and less adequate (B) and risk of a costly fishing job constantly greater.

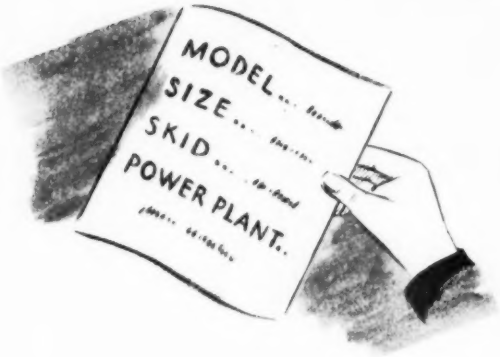
BAASH-ROSS DRILL COLLAR SLIPS consist of many narrow slip segments flexibly linked together. Result —they w-r-a-p around the drill collar and always take the same *full* grip whether drill collar is new or worn, round or out-of-round.

LINERS ARE EASILY RENEWED

To insure long life, minimum maintenance and maximum gripping efficiency at all times, the liners in Baash-Ross Drill Collar Slips can be readily renewed by simply pulling a stainless steel pin, sliding out the worn liner, inserting a new liner and replacing the pin. *It's simple, quick and inexpensive!*



Complete detailed records



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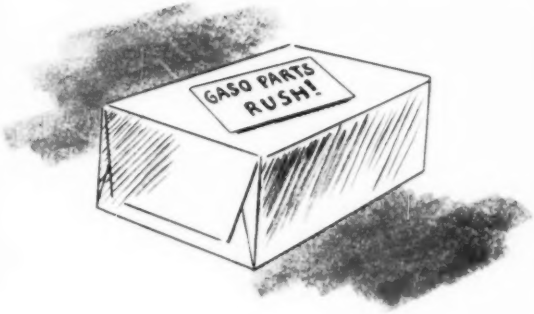

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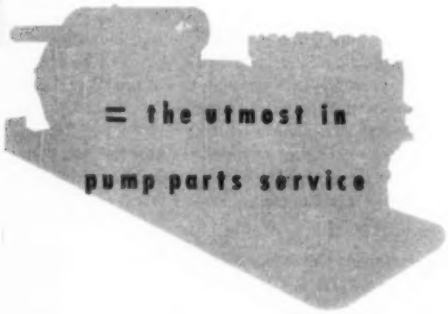

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all magnetic anomalies is either (1) due to elevation of the basement surface, or (2) due to lateral variations in magnetic properties of the basement rocks; or (3) a combination of (1) and (2).

Anomalies due to local highs in the basement rocks are of limited areal extent and magnitude if the basement rock is magnetically homogeneous. As a rule, the deeper the source of an anomaly, the greater its areal extent, but the less its magnetic relief. However, anomalies with large relief, covering whole townships, could not possibly be caused by basement uplift alone. A simple mathematical calculation will show that such anomalies have their origin in large lateral variations in the magnetic properties of the basement rock itself. (See Fig. 3). This lateral variation will partially mask the effect from a true basement structure within the same area. In many cases, an experienced interpreter can segregate the effect of the true structure from the lateral variation effects.

Since lateral variations in magnetic properties are often present in rocks forming the basement complex, it is not uncommon for a magnetic map to display a great many anomalies which may have no relation to structure. These are commonly called "polarization contrast anomalies." The interpreter of gravimetric data has a similar problem, since these same lateral variations in magnetic properties of the basement rocks are usually accompanied by variations in density of the igneous rocks giving rise to nonsignificant gravity anomalies.

The same general methods of separating the structurally significant from the nonsigificant anomalies have been applied in both magnetic and gravimetric cases. "Residual" maps are often made on an area in order to take out the "regional" effect so that smaller features show up more clearly. Space does not permit discussion of these here. Let it suffice to say, however, that the interpretation of both gravimetric and of mag. tic data cannot be unique. This means that any magnetic **or** gravity anomaly may be explained by a number of different distributions of polarization **or** of density contrasts. Therefore, in order to interpret anomalies in terms of structure, magnetic as well as gravimetric data must be combined with all geological information available. It must also be emphasized that the technique of magnetic interpretation has been considerably improved within the last few years. Magnetics today should not be condemned because of the poor interpretation and instruments of even 10 years ago.

There are still three primary advantages in reconnaissance prospecting with the magnetometer: First, it can give valuable clues as to what portions of an area are worth detailing with the more expensive seismograph; second, in rank wildcat territory, the magnetic method makes it possible to estimate the depth to the basement, and consequently the thickness of the sedimentary section in which oil and gas might be found; third, the cost of a magnetic ground survey is only about one-third that of the gravimetric survey, and about one-fourth that of the air-borne magnetic survey.

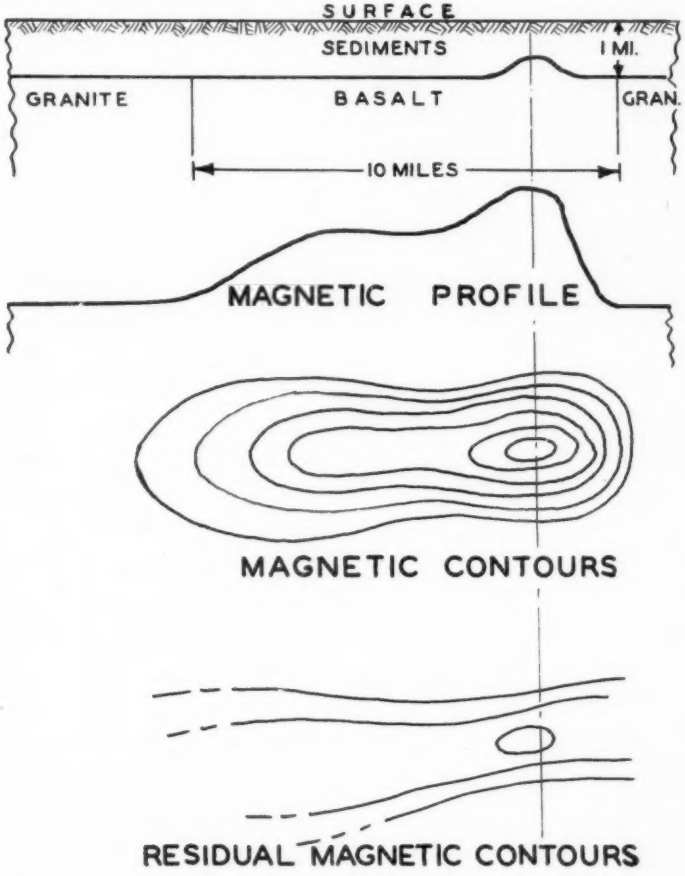


Fig. 3—Top diagram shows cross-section of earth's crust, with basement igneuos rock grading laterally from granite (with low magnetic value), to basalt (with high magnetic value), back to granite. Within basalt section near right is a true basement structure which will be reflected in sedimentary section. Second diagram shows type of single magnetic profile which will be found across such a section. Third diagram shows type of magnetic contour map which will result from such a condition. Modern magnetic interpretation methods can usually handle such situations. Fourth diagram shows what residual magnetic map will look like after applying modern interpretative methods

BOOKS

TWENTIETH CENTURY PETROLEUM STATISTICS, 1949. Published by DeGolyer & MacNaughton, Continental Building, Dallas. 63 pp. $7.50.

This is the fifth consecutive annual edition of this volume, which was first prepared in 1945 in the office of the Director of Naval Petroleum and Oil-Shale Reserves in the Navy Department, Washington. The director, Com. W. G. Greenman, U. S. Navy, urged that the handbook be maintained on an annual basis since demand indicated it filled a practical need. The volume follows a standard layout, with data arranged on spreads, tabular material on one side and accompanying graph on the opposite. Material is fully indexed.

CYLINDER WEAR IN DIESEL ENGINES. By Carl Hoegh. Published by Chemical Publishing Co., Inc., 26 Court Street, Brooklyn. 243 pp. $5.

This is a reference work for engineers who work with diesel engines or those engaged in the manufacture of diesel fuels and lubricants. Although much research work has been done to avoid cylinder wear, the accomplishments in this field are widely scattered in the literature. In the book, the author has correlated the available data on the subject. He discusses all factors affecting cylinder wear and summarizes the proposals for reducing wear and increasing the efficiency of diesel engines.

A. I. Ch. E. DIGESTS

Papers concerning the oil and gas industry presented at the American Institute of Chemical Engineers regional meeting, Tulsa, May 9-11

Session on Primary Energy

The Outlook for the Natural-Gas Industry

E. HOLLEY POE, E. Holley Poe and Associates, New York.

THE natural-gas industry in all of its related phases has propelled itself to a magnitude that makes it a fixture in our national economy. The financial, operating, and economic circumstances under which this growth has taken place have kept pace and in many cases exceeded the progress of competing industries, in service to our country, in expansion to markets and in prestige with its investors and customers. It is now one of the great basic industries of our nation; its service reaches many areas and many others want and are demanding it.

Economic Factors Involved in Selection of Boilers for Process Steam and Power Generation

W. S. PATTERSON and R. L. RIKER, Combustion Engineering—Superheater, Inc., New York.

THE effect of boiler type, size, pressure, steam temperature, and over-all efficiency on capital investment for steam-generating equipment is discussed in this paper. Selection of fuel-burning equipment and the effect of fuel cost in arriving at optimum over-all efficiency is also covered. Advantages and limitations of fuels and fuel-burning methods for combined firing and single-fuel firing are given consideration.

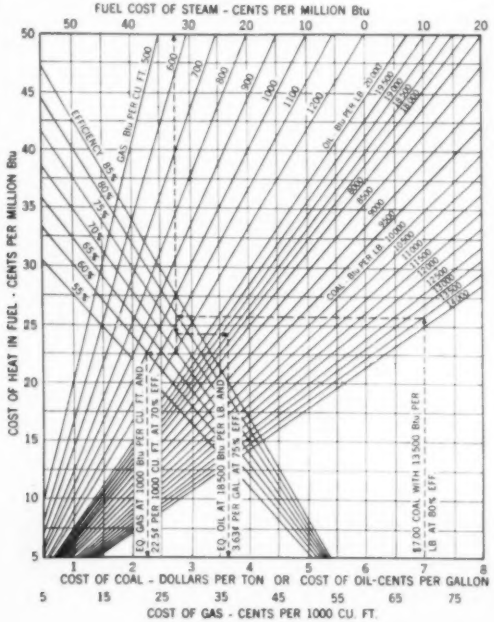
The role of heat-recovery equipment in the form of economizers and air heaters is covered in its relation to over-all efficiency and over-all cost. Boiler types designed specifically for use with efficient heat-recovery equipment are illustrated, and also types which give reasonably high efficiency without any heat recovery. Some of the factors involved in selecting boilers for combined power and process steam generation are enumerated and evaluated.

Liquid Fuels for Energy Supply

E. V. MURPHREE, E. J. GOHR, and F. T. BARR, Standard Oil Development Co., New York.

THE demand for liquid fuels as motor gasoline, aviation fuels (both gasoline and jet), diesel fuels, and domestic heating oil will probably continue to increase. Along with the demand for increased volume will be the demand, particularly for the case of motor gasoline, for improved antiknock quality. Due to the higher efficiency obtained with higher-compression-ratio engines, it is felt improvement in octane number of motor gasoline is in the direction of conservation.

The present proven oil reserves of the world represent about 21 years' supply of the 1948 world oil consumption rate. It seems likely the oil that will be discovered in the future will represent a volume much larger than present proven reserves and for this reason it is felt that the world's supply of oil products can be based on crude oil for many years ahead. At the same time it is felt that improvements resulting from research on processes for converting natural gas, coal, and oil shale into oil products will result in these raw materials representing a competitive source for oil products.


FUEL COST OF STEAM - CENTS PER MILLION Btu
COST OF HEAT IN FUEL - CENTS PER MILLION Btu
COST OF COAL - DOLLARS PER TON OR COST OF OIL-CENTS PER GALLON
COST OF GAS - CENTS PER 1000 CU. FT.
EFFICIENCY
EQ. GAS AT 1000 Btu PER CU. FT. AND 22.5¢ PER 1000 CU. FT. AT 70% EFF.
EQ. OIL AT 18,500 Btu PER LB. AND 3.63¢ PER GAL. AT 75% EFF.
$7.00 COAL WITH 13,500 Btu PER LB AT 80% EFF

Cost relationship of coal, oil, and gas fuels for steam generation (Patterson and Riker paper)

Fuel Consumption Devices and Prospects for Improvement

C. E. MILLER, Battelle Memorial Institute, Columbus.

SOME aspects of the conversion of fuel to heat and power in mobile and stationary plants, and the possibilities for improving the efficiency of various types of equipment used in these plants, are discussed in this paper. Such equipment may include automobile engines and locomotives in the field of mobile power, and domestic and small industrial plants in the stationary field. A summary is given of the types and relative quantities of fuels used and magnitude of the losses in existing types of equipment.

Session on Chemical Engineering Economics

The Value of Money

F. C. BROACH, National Bank of Tulsa, Tulsa.

AMONG the principal factors responsible for the lessened value of our money in terms of purchasing power is the enormous increase in our money supply. This increase was brought about by the financing of World War II and there is little reason to believe that any real progress can be had in reducing our money supply. Thus if the value of our money is to be increased it will have to be brought about by means other than a reduction in the supply, the factor primarily responsible for its lessened value. It is highly doubtful that our money will regain its prewar value.

Venture Profitability in Economic Balances

JOHN HAPPELL, New York University, New York; and R. S. ARIES, R. S. Aries and Associates, Brooklyn.

A METHOD for judging the attractiveness of new projects and for designing process plants has been developed taking into account the factors for risk and taxes, which seem to be of increasing importance in recent years. It is proposed that new ventures be compared on the basis of maximum additional profit above a predetermined rate of return consistent with the risk involved. When applied to the design of the component parts of a plant this index is equivalent to specifying that the last increment of investment shall yield some satisfactory return.

Whether the return rate is determined by the engineer or management, it is shown that such a figure must be available to the designer if he is to arrive at a selection of sizes and conditions which will constitute an optimum. Detailed equations are developed and a number of examples are given to illustrate the method. Results are compared with solutions of the same type problems by methods appearing in the recent technical literature and differences are discussed.

Economic Analysis in Petroleum Refining

J. P. HAMILTON, Humble Oil & Refining Co., Houston.

ECONOMIC analysis may be defined as the application of the common denominator—dollars—to manpower and materials consumed and products produced in order to establish the most economical course of action. This approach is important in helping to establish crude and

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product prices, most economical refining operations using new or existing equipment, and economically attractive research projects.

The basic tools used in preparing an analysis include equipment operating costs, equipment investments, raw material costs, and product market prices and are discussed in some detail. The fact that a problem may be simple in principle but complex in practice is illustrated. An explanation is given for the economic analyst's insistence on complete physical, geographic, and chronological material balances. The importance of the basis is emphasized. The approach is outlined for the solution of various problems such as: crude evaluations, total replacement costs of products, costs of incremental products, economic balances to establish optimum operation of existing equipment, justification of new equipment, and evaluation of research problems.

Economics of Thermal Reforming

C. F. FEUCHTER, Pan American Refining Corp., New York.

MANY refiners employ thermal reforming of straightrun naphtha to increase the octane number of their gasoline. While the process improves gasoline quality it also lowers the yield of salable liquid product. The optimum reforming level is determined by an economic balance between the cost of tetraethyl lead required to reach specification octane levels and the loss in yields sustained by thermal reforming. The method of computing optimum reforming level is demonstrated for a hypothetical refinery in which both the severity of reforming and the boiling range of the straightrun naphtha being reformed are varied until that point is reached where the cost of meeting octane specifications is at a minimum.

Curves are presented showing the changes in optimum reforming level with changes in octane specifications, price of products, and cost of tetraethyl lead. Sufficiently detailed correlations of naphtha-reforming data are included to permit a refiner to calculate the optimum reforming level for his own specific situation.

Economics of Tonnage Oxygen Production

IRVING ROBERTS, Elliott Co., Jeannette, Pa.

THIS paper is devoted to a study of the design of a tonnage oxygen plant and to the economics of oxygen production by the Elliott process. After a brief review of the cycle as applied to a large scale plant, and a study of the value of low-temperature refrigeration, economic analyses are made of such design factors as optimum warm end temperature difference, optimum oxygen recovery, and optimum compressor discharge pressure. Finally, a summary of costs of oxygen production is given for various plant sizes.

Optimum Propane Recovery in Natural-Gasoline Plants

BEN M. HOLT, Ralph M. Parsons Co., Los Angeles.

A QUALITATIVE discussion of the application of various methods available for recovery of propane from natural gas is given. A case study is presented of a high propane recovery plant involving the use of oil absorption and Hypersorption.

The economics of this plant is compared with an oil-absorption plant designed for high propane recovery. The effect of certain of the process variables on the optimum propane recovery from the oil absorption Hypersorption plant is discussed.

Session on Chemicals from Petroleum

Chemicals from Hydrocarbon Synthesis

T. Q. ELIOT, C. S. GODDIN, JR., and B. S. PACE, Stanolind Oil & Gas Co., Tulsa.

COMMERCIAL hydrocarbon - synthesis plants in this country, based upon a modified Fischer-Tropsch reaction, will produce a variety of aliphatic oxygenated compounds as byproducts. In this paper typical yields of chemicals are presented for a commercial HCS plant designed to produce 7,000 bbl. per day of liquid hydrocarbons from natural gas. The distribution of these chemicals, ranging from low-molecular-weight, water-soluble materials to high-molecular-weight, oil-soluble materials is reviewed.

Recovery of the byproduct chemicals as crude mixtures from the several synthesis product streams is described. Emphasis is placed upon problems relating to the separation and manufacture of specification-grade chemicals from these crude mixtures. The need for additional fundamental data on physical properties and equilibrium behavior of the individual components and mixtures is indicated.

Production of Chemicals by Oxidation of Natural Gas Hydrocarbons

M. F. WIRGES and J. W. PALM, Cities Service Oil Co. (Del.), Tallant, Okla.

DIRECT oxidation of natural-gas hydrocarbons is used for the commercial production of substantial quantities of formaldehyde, acetaldehyde, methanol, acetone, and other chemicals. A flow sheet showing the steps in the oxidation process is presented and various methods employed for carrying out these steps are discussed. The important variables in the process are temperature, pressure, makeup composition, recycle, catalyst, and reaction time. These variables are discussed and data concerning their effects on the reaction are presented.

Production of Aromatics

C. H. MARSHALL, Humble Oil & Refining Co., Houston.

A BRIEF history of toluene production in the United States from its introduction as a coal-tar byproduct to its manufacture in large quantities from petroleum is presented by the author. Specific information is included on operations at Baytown Ordnance Works and the hydroforming process employed. Wartime operations for toluene production with xylenes as a byproduct are discussed together with some of the problems encountered.

Postwar operations at the plant after its purchase by Humble Oil & Refining Co. for the production of toluene, xylene, and heavier aromatic solvents are described. These operations include recent changes to produce an aviation toluene concentrate by precise fractionation of the toluene fraction and the manufacture of high-purity heavy aromatic solvents by careful control of hydroformer feed cut points.

Resins and Siccative Oils From Petroleum

ROBERT F. RUTHRUFF, consulting chemical engineer, Homewood, Ill.

A HOST of solid hydrocarbon polymers and hydrocarbon liquids exhibiting siccative properties have been introduced by various petroleum organizations for use in the surface-coating industry. These materials are prepared from a wide variety of petroleum products and byproducts, including butadiene, styrene, indene, polymers from the clay treatment of gasoline, and "drip oil," this last including petroleum derived byproducts having a composition similar to gas house drips. The preparation and properties of some of the more widely known of these materials are briefly considered.

The paper presents also a brief review of a few polymers prepared from nonhydrocarbon chemicals derived from petroleum. Obviously, this group includes theoretically at least, practically all resins presently employed in the surface coatings industry so the discussion is limited to (1) vinyl chloride polymers, (2) the so-called "ether resins" made by the interaction of epichlorohydrin and a phenol and (3) resins prepared by the reaction between formaldehyde and certain byproducts of the catalytic aromatization process.

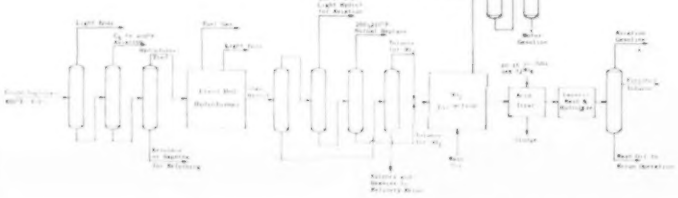
Session on Oil And Gas Production

Petroleum Production as a Field for Chemical Engineering

H. H. KAVELER, Phillips Petroleum Co., Bartlesville, Okla.

THE opportunities that exist to practice chemical engineering in the field of production operations are discussed in a general survey of the type of activities encountered in petroleum production practices. In recent years, when the necessity of conserving the national petroleum resources is a matter of importance, more attention is being given to improvements derived from research and engineering practices. In the past 20 years a substantial technical field has been developed in respect to the entire petroleum production industry, including such practices based

Schematic flow arrangement of wartime operations at Baytown Ordnance Works (C. H. Marshall paper)



upon chemical engineering as drilling muds, reservoir engineering, corrosion control, oil-well cementing, acidiaztion of formations, oil-well explosives, and artificial lift.

Role of Physics and Chemistry in Petroleum Reservoir Mechanics

L. E. ELKINS, Stanolind Oil & Gas Co., Tulsa.

A REVIEW of progress to date is presented demonstrating the significant contributions that the sciences of physics and chemistry have made in the development of technology for producing oil from its natural occurrence in reservoir rocks. The determination of the characteristics of reservoir oil and its contained gas in solution as affected by pressure decline has provided a most significant tool whereby the engineer can accurately measure oil reserves and intelligently control the recovery efficiency of oil from the reservoir.

It is demonstrated, however, that research has yet much to do before determining the effect of surface and interfacial tension characteristics on oil, gas, and water movement in pores of capillary size. Too little is known in the field of capillary performance, and yet the nation's reserves may be increased in the order of magnitude of 5 to 10 billion barrels if these factors can be truly measured and steps taken to either employ such forces in the recovery of oil where they are favorable or overcome their retentive tendencies where such is the case.

Phase Relations in High-Pressure Petroleum Reservoirs

DONALD L. KATZ and BRYMER WILLIAMS, University of Michigan, Ann Arbor.

THIS paper summarizes the growth of knowledge of the behavior of liquid and gas in petroleum reservoirs. Gas reservoirs existing at high pressures and at temperatures higher than the critical temperature contain gas with dissolved liquids which precipitate by the process of retrograde condensation upon reduction of pressure. High-pressure oil reservoirs contain liquids from which gases are evolved upon reduction of pressure. Oil fields are being discovered in which the temperature is close to the critical temperatures of the fluids.

An analysis of the phase behavior in the vicinity of the critical point demonstrates the continuity of physical properties and phase behavior between the so-called liquid and gaseous regions. The necessity and reasons for pressure maintenance or cycling in high-pressure oil reservoirs therefore differs only in degree from those for high-pressure gas fields.

Mud Control and Design

VICTOR HORNER and W. B. KIMBRELL, Baroid Sales Division, Tulsa.

DRILLING-MUD control is designed to increase the efficiency these drilling mud functions:

1. To act as a transporting medium in removing cuttings from the face of the bit and later permitting them to settle in the ditch or pit.

2. To provide adequate hydrostatic head against all formation pressures encountered.

3. To seal the face of the formation as exposed in drilling without the subsequent deposition of too great a cake thickness or without too great a loss of fluid into permeable formations.

Such properties are imparted to the drilling fluid by control of the several physical characteristics of the drilling mud, such as control of density by means of incorporating in the drilling mud high specific gravity minerals (barite); control of viscosity and gelation by means of adding to the drilling mud highly colloidal clays (bentonite); and through use of viscosity-reducing chemicals (water, tanstuffs, and polyphosphates), and control of filtration characteristics through proper use of bridging and plugging materials of a fibrous or flaky nature and with clays or organic materials of high colloidal content.

Economics of Alkylation And Polymerization

R. E. SUTHERLAND and J. L. DOEGEY, Universal Oil Products Co., Chicago.

ALKYLATION and polymerization are the most important processes involved in processing olefin gases and in many instances there is a definite advantage of one over the other, depending on the quantity and type of olefins to be processed, the availability and cost of light hydrocarbons for vapor-pressure requirements, the availability of isobutane, the quality of product demanded by the particular marketing setup, and many other factors.

The basic plant and production costs have been determined for U.O.P. polymerization and HF alkylation and are shown as a function of olefin charge rate. These costs have been used in the determination of the most profitable operation for refineries of various capacities located in different sections of the United States. The method of calculation of the optimum operation can be used for any specific refinery setup by changing the factors and costs to those applicable to the area and plant under consideration. Conditions that might lead to the selection of sulfuric acid alkylation, other processes, or auxiliary equipment are discussed.

The Manufacture of Ethylene Oxide

ROBERT S. ARIES and HENRY SCHNEIDER, R. S. Aries and Associates, Brooklyn.

THE technical and economic aspects of the production of ethylene oxide by the chlorhydrin and oxidation processes are discussed and evaluated quantitatively. An economic balance between the two processes is presented, taking into account the investment, operation, and overhead costs for a plant producing 10,000,000 lb. of ethylene oxide per year. Flow sheets and other details are given.

At current price levels for ethylene and chlorine, catalytic oxidation should be competitive with the chlorhydrin process at selectivities above 60 per cent. Pilot-plant data indicate this possibility with the aid of appropriate catalysts.

Optimum Reflux Ratio

D. B. CRAWFORD, Southwest Research Institute, San Antonio.

MANY of the economic factors to be considered when designing or operating fractionating equipment are presented. The relation of cost of raw materials, heat, refrigeration, cooling water, insulation, and equipment are adjusted in accordance with the market value of the product, product value versus purity, seasonal demands, changes in feed composition, amortization rate, etc.

Suggestions on adjusting a plant, already in operation, to optimum conditions are given. Examples showing the author's methods of handling simple two-component separation problems are given.

Mud Control and Design In Modern Drilling

(Continued from page 88)

a partial or complete loss of drilling mud to the formation, bridging and plugging materials of a fibrous or flaky nature are incorporated in the mud. An accompanying photograph illustrates the plugging action of mud ladened with several such materials.

Protection of permeability in reservoir zones may be related to the chemical composition of a mud and may be a factor in initial production rates. This thought has led to the use of extremely low-filtrate fresh-water muds, oil-base muds, and oil-emulsion muds for well completions. Use of limed or salt-water muds, or muds so treated that the filtrated would duplicate the chemical composition of formation interstitial water, are being tried.

Abrasive and corrosive action of drilling fluids are of sufficient importance to be controlled. Gel-strength reduction through chemical treatment permits the dropping of abrasive sand cuttings in surface settling ditches and tanks. Sodium chromate and sodium nitrite are being used for retarding the corrosive effect of some drilling muds on drill pipe. A maintained concentration of 2,000 p.p.m. of either of these salts in the drilling mud has been found adequate to arrest any observable corrosion.

Interpretation of electric-logging data is influenced by the effect of the chemicals in the mud upon the resistivity of the mud. It is most advantageous for sake of correlative interpretation of electric-log data for mud resistivity to be within a suitable range.

As the drilling-mud engineer recognized the importance of drilling-mud design and control to the complete drilling operation, he developed instruments for measuring these properties to better prepare a basis for analytical study. The mud hydrometer or balance was devised for density measurements; the Marsh funnel and Stormer viscosimeter are used for viscosity and gel-strength measurements; the Bariod low and high-pressure filter press units were designed for evaluating filter loss and filter-cake properties; a sand-test kit was designed for measurement of amount of abrasive material; filtration analysis and alkalinity measurements are used for proper diagnosis and maintenance work.

BOOKS

PETROLEUM—THE STORY OF AN AMERICAN INDUSTRY. Prepared and published by the American Petroleum Institute, 50 West 50th Street, New York. 118 pp. $1.

This edition is the third issue of a popular booklet first published by the A.P.I. in 1930. Completely rewritten and much ex-

panded, this edition is intended to provide answers to the many old and new questions regarding the origin, source, and uses of petroleum and its products, as well as to furnish factual information about the complex but highly efficient operations of the petroleum industry. Well illustrated with maps, charts, and drawings, the book portrays the history of petroleum from its beginnings, its birth as an industry in Titusville, Pa., in 1859, and its widespread use and benefits today. Special chapters are devoted to discovery and production, refining, transportation, marketing, and conservation.

Production of Chemicals

(Continued from page 92)

and varies inversely with the makeup B.t.u., pressure, and contact time.

Makeup composition.—Use of a gas containing larger amounts of higher-molecular-weight hydrocarbons will result in a higher chemical yield. Table 2 indicates the effect of makeup gas composition on the amount of reacted materials going to the various products.

Thus it is seen that considerably higher chemicals yields are obtained with the higher-B.t.u. gas. It should be pointed out, however, that the richer gases are more valuable; hence with makeup gases containing considerable amounts of propane and heavier it is economically desirable to operate a hydrocarbon recovery system on the tail gas.

The makeup composition also affects the relative amount of the various chemicals produced.[5,7] The chemical produced in largest amount with each of the lower-molecular weight hydrocarbons is as follows: methane—methanol; ethane—formaldehyde; propane and normal butane—acetaldehyde; and isobutane—acetone.

TABLE 2—EFFECT OF MAKEUP B.T.U. ON RELATIVE YIELD

Makeup B.t.u.	1,276	1,920	2,540
Mol per cent of reacted carbon to:			
Chemicals	42.0	62.5	75.0
Oxides of carbon	58.0	37.5	25.0
Mol. per cent of reacted hydrogen to:			
Chemicals	23.1	63.0	65.5
Water	76.9	37.0	34.5
Mol. per cent of reacted oxygen to:			
Chemicals	19.9	36.6	43.6
Water	41.5	35.1	18.9
Oxides of carbon	38.6	28.3	37.5

Recycle.—In commercial operation part of the product gas may be recycled to the reactor after removal of the liquid product in order to increase the yield of chemicals per unit of fresh makeup gas. The result of this may be shown by plotting the formaldehyde yield versus the per cent makeup, where per cent makeup is defined as makeup rate times 100 divided by makeup rate plus recycle rate.

Fig. 2 shows such a correlation for operation with dry natural gas, using data of James[6] and also of Thompson et al.[6] As is shown in Fig. 2, when the per cent makeup is decreased from 100 to 20 per cent the yield per unit of makeup increases slowly. As makeup is further decreased toward zero per cent the yield increases sharply. When plotted on a log-log scale as in Fig. 2A, a straight line is obtained.

In Fig. 3 are plotted the yield per hour and the quantity of makeup required per hour at various values of per cent makeup. These curves were calculated using data from the curve of Fig. 2 and assuming the sum of makeup plus recycle to remain constant at 100 M.c.f. It is apparent from these curves that the optimum recycle ratio might be in the range between 5 and 20 per cent makeup, since in this range an appreciable yield per hour is obtained with a relatively small amount of makeup being consumed. The exact value for the optimum per cent makeup depends on a number of factors, the principal ones being the cost of the makeup gas, value of the crude produced, and capital costs for the plant.

Catalysts.—Satisfactory yields are obtainable from the oxidation reaction without the use of catalytic materials. However, a large number of materials have been investigated for possible catalytic effect.

A variety of compounds have been reported as favorable for the oxidation reaction.[8] These catalysts may consist of materials known to favor dehydration, dehydrogenation, or oxidation, including platinum, chromium, manganese, copper, nickel, aluminum oxide, and aluminum phosphate. The oxides of metals capable of forming higher and lower oxides, such as copper, manganese, iron, nickel, vanadium, chromium, and molybdenum, have also been used successfully.

Catalysts must be selected carefully since many materials which promote oxidation carry the reaction to completion, producing carbon dioxide and water.

Reaction time.—The time required for the reaction may vary with the conditions employed, it being affected by the temperature, pressure, and catalyst. The time is usually in the range of ¼ to 2 seconds. Use of too short a reaction time results in incomplete conversion while use of an excessively long time causes decomposition of the alcohol and aldehyde products.

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Subject: Summarize important considerations in upgrading low-octane gasoline.

Discussion: (By Edwin F. Nelson, vice president, Universal Oil Products Co., from paper given at recent annual W.P.R.A. meeting, San Antonio).

IT is well known that the major problem in raising the octane level of the total refinery gasoline output is created by the large volume of low-octane straight-run gasoline. The industry has had available a number of processes for upgrading straight-run gasoline. Each of these processes suffers from one or more of the following major disadvantages:

1. Limited octane-number improvement.
2. High volumetric loss.
3. High plant and operating cost.

These processes, nevertheless, have been more and more widely adopted as a result of irresistible pressure for higher octane number. They include:

1. Mercaptan extraction.
2. Hot clay or bauxite treatment.
3. Thermal reforming.
4. Thermal reforming plus catalytic polymerization.
5. Polyforming.
6. Hydroforming.

The first two of these are essentially desulfurization processes, which give moderate improvements in leaded octane numbers at high yields and low operating costs. Refiners so fortunately situated that they can meet their octane requirements by such processes will continue to find them satisfactory.

The other processes listed are capable of producing substantial improvement in octane number, at the inevitable price of lower yield and higher cost. Thermal reforming has been in commercial operation since about 1931. The most important reaction in thermal reforming is cracking. All hydrocarbons can be cracked, but in general the paraffins are somewhat more susceptible to this reaction than other constituents of straight-run gasoline. Among the paraffins, there is a definite increase in cracking susceptibility with boiling point.

The liquid products of paraffin cracking have improved octane numbers both because they are lower in molecular weight and because they are somewhat unsaturated. It is evident from this picture that thermal reforming does have a certain inherent selectivity. This selectivity is reflected in the first part of the yield-octane curve, which shows a relatively steep rise in octane number. The volumetric loss is almost entirely represented by gas, with only a slight formation of higher-boiling materials.

Unfortunately, the initial slope of the thermal reforming yield-octane curve is not long maintained, and a limiting octane number is reached which cannot be significantly increased no matter what loss is taken. This situation reflects the fact that the inherent selectivity of thermal reforming is almost completely exhausted at a yeild of 80-85 per cent. The products of selective thermal reforming are not of exceptionally high octane number, and hence the yield-octane curve becomes flat at an undesirably low level.

Revisions Are Completed

Revisions to the thermal cracking equipment in Old Dutch Refining Co.'s Muskegon, Mich., plant were completed early in the second quarter of this year. Revised process now in operation is rated at 2,000 bbl. per calendar day. The thermal operations include a 200 bbl. per day polymerization plant. Crude-oil capacity of the refinery is 4,500 bbl. daily.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Painting Costs

In your article on costs of pump and control houses, you mention the cost of painting in terms of colors. Is not the kind of equipment that is painted of great importance?—N. A. P.

It is quite true that it costs much more to paint pipe or a piping system than to paint a tank or wall. The costs given in the Cost-imating No. 23 article of March 24, 1949, came from one of the major paint manufacturers and the figures given later here are also those of another paint manufacturer. In general, the two sets of figures are comparable if the average cost of painting is taken as about $8 per square (100 sq. ft.) for a two-coat job. This includes no preparation or cleaning and is a 1948-1949 cost. Including a thorough hand-cleaning job the average cost is about $13.50 per square.

A similar figure but stated for a complete job including thorough hand cleaning, but based on 1 gal. of paint, is about $25 (1948-1949 cost). This figure includes all costs such as some travel, office overhead, and any miscellaneous expenses involved in a big painting program being conducted by a large oil company. Obviously, the location of the work will alter the costs somewhat, and the types of equipment being painted also affects the cost (see Table 1).

TABLE 1

Approximate Complete Painting Costs as a Function of the Kind of Equipment Painted (1948-1949)

(Dollars per gallon of paint applied)

	Cost	Factor
Average (weighted)	$25.00	1.00
Production, leases, tanks, etc.	15.00	.60
Lease houses	20.00	.80
Filling stations	32.00	1.28
Refinery piping	45.00	1.80

Note that the color of paint is not mentioned in Table 1 and it is clear that the cost of the paint is a small item. Color does not have as large an effect on the final coat as might be inferred from the costs given in Cost-imating No. 23 because the coverages are different for each color or type of paint, and particularly because cleaning is not included in the costs stated in Cost-imating No. 23. Table 2 is, therefore, presented to show the general effect of color or type of paint. A cost of 3 to 6 cents per square foot is included in the costs of Table 2 for a thorough job of hand cleaning and for overhead.

Cleaning by hand brushing ranges from 3 to 6 cents per square foot if properly done. Sandblasting costs at least 10 cents per square foot and may in extreme cases cost as much as 20 cents.

It should be noted particularly that coverage is extremely important. Thus, whereas the cost of applying a gallon of black paint ($31-$36) is larger than the cost of almost any other paint because of the large area that must be cleaned for it, the same black paint on a square or coverage basis is the cheapest, i.e., $11.30 per square.

Research and Motor Octane Numbers

Why do we have two kinds of octane number? What should the two octane numbers be?—R. M.

The use of two octane-number tests, the research and the motor method, is definitely related to the fact that these laboratory methods of determining the knock characteristics of a gasoline are somewhat inadequate. The laboratory tests do not faithfully indicate the road performance of the material.

In general, a high motor method octane number indicates good high-speed performance, whereas a high research octane fuel is better for city driving where the speed is low and there are frequent accelerations. Thus, it would seem that a measure of road performance would be somewhat the average of the research and motor octane numbers.

Thermally cracked, reformed, and poly gasolines exhibit a good low-engine-speed performance because they have a relatively high research octane number. This applies generally to those gasolines that contain large amounts of the lower-boiling olefin hydrocarbons. At the other extreme, catalytically cracked gasolines and straightrun gasolines, if they are of high octane number, impart good high-speed performance. The aromatic hydrocarbons are desirable in imparting such characteristics. Tetraethyl lead is most useful in raising the motor octane number of straight-run or desulfurized fuels, and hence it is a means of imparting high-speed performance.

Finally, L-head engines tend to knock at high speeds and valve-in-head engines tend to knock at slow speeds. It is therefore necessary in supplying the general public to offer both performance in one fuel, i.e., to have both a high motor octane number (73 to 80) and a high research octane number (88 to 95). Of course, if the trade can be confined to one type of drivers, then a gasoline could be tailor made for that particular trade.

There is much controversy as to whether a fuel which has an 80 octane number by both methods of test (M and R) is the equal of another gasoline whose average octane number by the two methods is 80. The latter might be represented by a fuel which has a motor octane number of 75 and a research octane number of 85. Whereas 80 sounds like a good octane number, a motor octane number of 75 is only mildly impressive, and a research octane number of 85 is not impressive. Thus, in selecting the spread (or difference in research and motor) of octane number, it would seem that the octane number by each method should be considered separately. Each of them is important.

TABLE 2—APPROXIMATE EFFECT OF COLOR OR KIND OF PAINT ON THE COST OF PAINTING (1948-1949 COSTS)

(Dollars per gallon of applied paint)

Kind of paint—	Coverage* (sq. ft.) per gal.	Material and labor cost† ($ per gal.)	Hand cleaning‡ ($ per gal.)	Total cost: $ per gal. applied	Factor	$ per square†	Factor
Average				25.00	1.00	13.50	1.00
Iron oxide primer	250-300	9.20-12.60	11.00-12.50	22-24	.92	12.40-15.70	1.04
Aluminum	300-400	11.20-13.50	10.75-13.30	21-27	.96	12.00	.89
Black	500-600	15.40-18.20	15.75-18.25	31-36	1.34	11.30	.84
White:							
On tanks	300	16.80	10.75	27.50	1.10	15.70	1.16
On houses	250-300	17.90	7.00	25.00	1.00	14.90	1.10

*One coat. The second coat spreads further—about 50-100 sq. ft. more per gallon. †Two coats (an average). The second cost costs only 50 per cent as much as the first cost. ‡Depends entirely upon the kind and condition of the surface. The values used are only illustrative of common practice, although examples can be found of entirely different practices.

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ENGINEERING fundamentals

No. 370

Viscosity of a Reservoir Gas

FOR calculations involving the flow of reservoir fluids an evaluation of viscosity at reservoir conditions is necessary. Previously, the viscosity of reservoir oil was discussed. The variation of reservoir-gas viscosity is equally important although not usually so great in magnitude.

For a perfect gas an increase in gas temperature increases the viscosity. This effect, opposite to that noted for liquids, is due to the increased kinetic energy of the gas at the higher temperature. For a perfect gas also, the viscosity of the gas is independent of the pressure. Since natural gases are not perfect both of these concepts must be modified, although they serve in understanding the observed variation at low pressures where natural gases are most nearly perfect.

For natural gases, as higher pressures are reached, the gas takes on more of the attributes of liquid behavior. The variation of viscosity with pressure and temperature in this region is the same as that for a liquid, higher pressures and lower temperatures both increasing the viscosity.

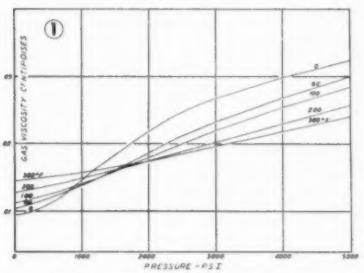
The measurement of gas viscosities at reservoir conditions is not routine as it is for liquid viscosities. The best available data for estimating reservoir gas viscosity is that given by Bicher and Katz.[1] These investigators measured the viscosities of various mixtures of methane and propane and correlated measured viscosities with molecular weight. They then checked their resulting correlations with measurements on actual gases and found the agreement to be highly satisfactory. Subsequently, Beal[2] replotted the data of Bicher and Katz to show gas gravity rather than molecular weight as a parameter.

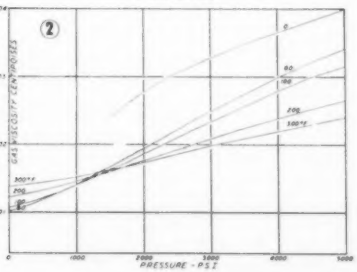
The same data have been crossplotted here in Figs. 1 to 5 to show the complete variation of viscosity with pressure and temperature for a definite gas on a single graph. As noted in the above discussion, at low pressures the viscosity variation is more in line with that required for a perfect gas, and at high pressures the variation is in the same direction as that for liquids.

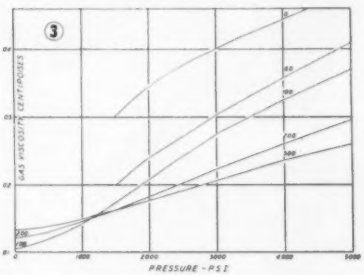
References

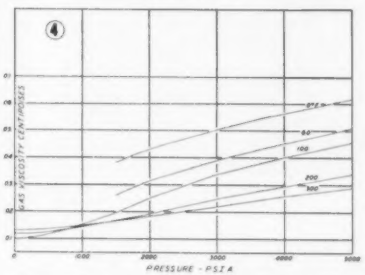
1. Bicher and Katz, Viscosity of Natural Gases, Trans. A.I.M.E. (1944), Vol. 155, 246.

2. Beal, The Viscosity of Air, Water, Natural Gas, Crude Oil, and Its Associated Gases at Oil-Field Temperatures and Pressures, Trans. A.I.M.E. (1946), Vol. 165.









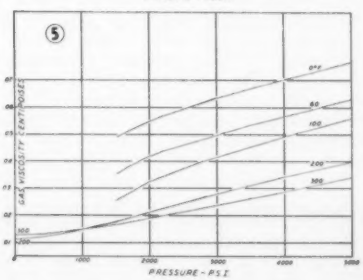


Fig. 1—Gas viscosity as a function of pressure and temperature. Specific gravity = 0.6. Fig. 2—Gas viscosity as a function of pressure and temperature. Specific gravity = 0.7. Fig. 3—Gas viscosity as a function of pressure and temperature. Specific gravity = 0.8. Fig. 4—Gas viscosity of pressure and temperature. Specific gravity = 0.9. Fig. 5—Gas viscosity as a function of pressure and temperature. Specific gravity = 1.0 [Data of Bischer and Katz, "Viscosity of Natural Gases," Trans. A.I.M.E. (1944), Vol. 155, 246]

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TENTATIVE SCHEDULE OF TOPICS

No. 20—March 3—Clay and Cement Pipe
No. 21—March 10—Depreciation Rates—Petroleum
No. 22—March 17—Cost of Buildings
No. 23—March 24—Pump and Control Houses
No. 24—March 31—Brick and Tile
No. 25—April 7—Pipe Stills
No. 26—April 14—Furnace Details
No. 27—April 21—Tubes and Bends
No. 28—April 28—Structural Steel Frames
No. 29—May 5—Centrifugal Pumps
No. 30—May 12—Pump Materials and Drives
No. 31—May 19—Large Motors
No. 32—May 26—Electrical Equipment
No. 33—June 2—Filter Presses

COST-IMATING No. 29 of May 5 stated the costs of centrifugal pumps complete with starting switch and motor. This contemplated standard motors, and the pumps were constructed of cast iron with steel shafts and with bronze impeller and wear rings. The extra costs for explosionproof motors, or of noncondensing turbine drives over the cost of standard motors is given in Table 1. Likewise, Table 2 shows extras for special construction materials. These are taken primarily from Happel, Aries, and Borns, Chemical Engineering, October 1946, page 99, and from Chemical Engineering Economics, third edition, by C. Tyler (McGraw-Hill Book Co., New York, 1948). The extra costs shown in Table 2 apply only to the pump (not the motor or starter), and hence the costs of motors are indicated in Table 3 from Happel, Aries, and Borns. In addition to Table 3, C. Tyler gives the following equations for two classes of motors:

Type A motors.—Open construction, general purpose, 220, 440, or 550 volts, three-phase, 60 cycles, 1,800 r.p.m.

Type A = \$40 + \$6.6 per hp.

Type B motors.—Totally enclosed for Class 1, Group D location, 220, 440, or 550 volts, three-phase, 60 cycles, 1,800 r.p.m.

Type B = \$60 + \$12 per hp.

Slow-speed motors (514 or 600 r.p.m.) are much more expensive. In the larger sizes (20-100 hp.) the cost is two or three times as much as given in the equations, and for the smallest sizes, the cost may be five or six times as much.

TABLE 1—EXTRA COSTS (1946) FOR TURBINE DRIVES OR EXPLOSIONPROOF MOTORS
(These apply to Fig. 1 of Cost-imating No. 29)

Extra for explosionproof motors:	
1- 5 hp.	\$40 per motor
5- 10 hp.	\$50 per motor
10-100 hp.	\$5-\$7 per hp.
Extra for turbines (non-condensing):	
10- 30 hp.	\$35-\$30 per hp.
30-100 hp.	\$15-\$35 per hp.
100-300 hp.	\$ 8-\$15 per hp.

TABLE 2—EXTRA COSTS (1946) FOR SPECIAL MATERIALS FOR CENTRIFUGAL PUMPS
(These apply to Fig. 1 of Cost-imating No. 29)

	Extra cost, per cent*
All iron	5
All bronze	50
Everdur	50-75
Monel metal or stainless steel	200-400
[illegible]	300-500
Illium or Inconel	400-600
[illegible] V	500-800
Rubber lined (low head, large)	100
Stoneware (low head, medium)	150-200
Case only:	
Cast steel	30-60
Bronze	10-25
11.5-13 chrome	60-100
18-8 stainless or lead lined	[illegible]
Monel	120-170
Impeller only:	
11.5-13 chrome	5-10
18-8 stainless	8-20
Monel	10-20
Fittings and trim, 11.5-13 chrome†	†5-10

*Applies to the pump without starting switch or motor. See Table 3 here for the cost of motors. †20-30 per cent if stellite rather than chrome trim.

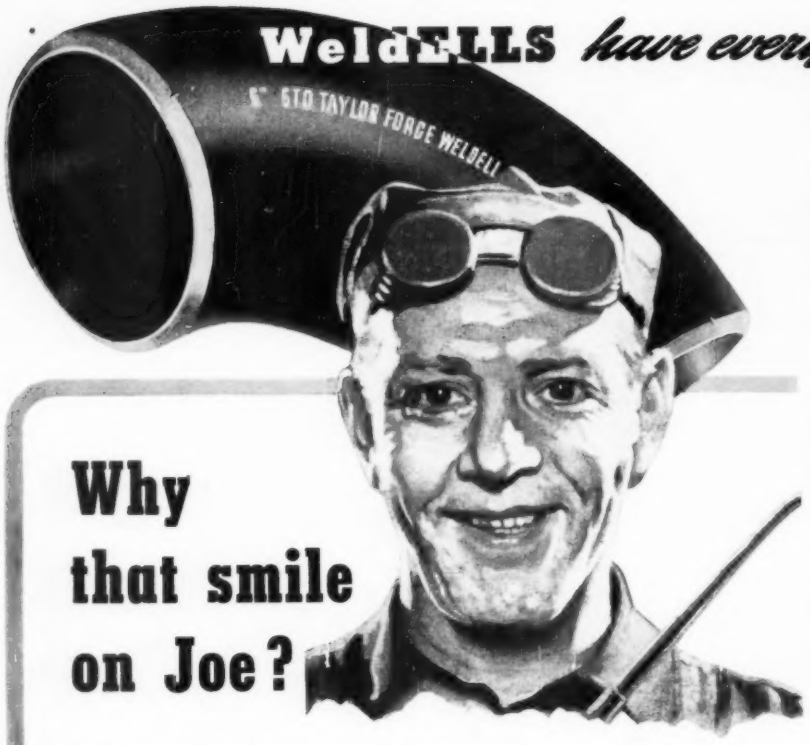
TABLE 3—COST OF MOTORS INCLUDING LINE, STARTER, AND SAFETY EQUIPMENT (1946)

	Equipment (\$ each)	Installation (\$ each)
Splashproof, 220 volt:		
1- 5 hp.	100- 170	200- 300
5- 20 hp.	200- 250	330- 470
20- 30 hp.	300- 350	480- 660
30- 50 hp.	500- 650	800-1,100
60-100 hp.	1,000-1,300	1,600-2,300
Splashproof, 440 volt:		
1- 5 hp.	100- 170	200- 300
5- 20 hp.	170- 230	320- 450
20- 30 hp.	250- 300	400- 550
30- 50 hp.	300- 400	550- 900
60-100 hp.	600- 800	1,000-1,700
Explosionproof, 220 volt:		
1- 5 hp.	150- 250	230- 400
5- 20 hp.	250- 350	350- 500
20- 30 hp.	400- 500	530- 800
30- 50 hp.	600- 700	900-1,200
60-100 hp.	1,200-1,500	1,700-2,500
Explosionproof, 440 volt:		
1- 5 hp.	150- 230	230- 430
5- 20 hp.	250- 300	375- 500
20- 30 hp.	300- 400	550- 850
30- 50 hp.	450- 600	700-1,100
60-100 hp.	600- 800	1,000-1,800

E. Kun in his "Motor-Voltage Considerations in Petroleum Refineries," (The Oil and Gas Journal, March 2, 1946, page 86) shows about the same total costs as those of Table 3 but his equipment cost is about 25 per cent larger. An index of electrical construction costs was published in Cost-imating No 1 of October 21, 1948, and it will be repeated in next week's issue.

No. 30 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

WeldELLS *have everything...*



Why that smile on Joe?

Joe may not know much about the engineered strength of WeldELLS, or the metallurgical control, or the greater scope of the WeldELL line. However, it is plain enough that these considerations which mean so much to you begin to lose meaning unless Joe does *his* part of the job right.

That's why we designed WeldELLS, not only for you, but also for Joe. That's why Joe smiles: A good Welder like Joe takes extra pride in the kind of job he can turn out when it's made easy for him by these easily identified fittings, with sized end tangents, cleanly machined bevels, precision quarter markings to speed lining up, accurate key dimensions, plus other conveniences that are combined only in WeldELLS.

Yes, Joe does a better job with WeldELLS . . . and in the final analysis, *your* work rests on Joe's work!

Remember that the line which offers the most to both you and Joe, also contains the most complete range of sizes, thicknesses, and types of fittings, *and* in a complete range of materials. Convenient stocks are carried in all industrial centers.

Note these features that appeal to the man on the job:

No guess-work; markings clear and complete.

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Extreme accuracy, uniformly maintained.

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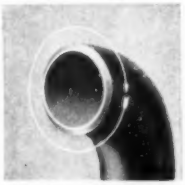

Cleanly machined bevels.

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Corresponding to new equipment items or trade literature abstracts in the Oil and Gas Equipment Digest of The Oil and Gas Journal, May 12, 1949

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OIL AND GAS EQUIPMENT Digest

IT'S NEW ✓ CHECK IT

by Dan B. Miller

(1) TRUCK TRACKS. Truck operators may now fit their hauling equipment with crawler-type tracks. Designed to add tractor performance to conventional single

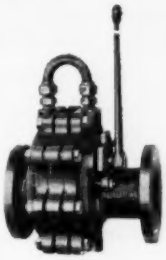
and tandem axle trucks, they have been tested and approved by U. S. Army Engineers. They permit effective hauling operations under mud, snow, and desert conditions which stall ordinary wheeled vehicles. Mounting the tracks is a simple operation which takes the driver about 10 minutes. Pads are made of drop-forged steel alloy. Fitting is done by adding or removing pads and linkage. Every pad has a master adjustment to assure proper tension. Connecting the pads is a cadmium-plated chain of heat-treated, high-tensile steel. *P & G Supply Co.*

IT'S NEW ✓ CHECK IT

(2) DRH FORGED-STEEL TUBING HEAD features a "steering wheel" that enables operator to easily compress, by hand pressure, the rubber packing mechanism above the slip suspension. The tubing head has a forged-steel body. Outlets are electrically welded to the heavy walled mechanical tubing body. It is designed for 3,000-psi. test pressure or 1,500-psi. cold working pressure. The packoff seal between casing and tubing is positioned above the slips permitting replacement of packing without disturbing the string of tubing. Casing size 7 in.; tubing size 2, 2½, and 3 in. *Don R. Hinderliter.*

IT'S NEW ✓ CHECK IT

(3) STEAM-JACKETED VALVE. Developed for transmission of viscous materials which congeal or harden and will not flow at ordinary temperatures. Disk slides across the ports in a rotating self-clearing action actuated by a quick operating lever. When wide open, the valve offers straight-through flow with unrestricted passage. All parts move in a parallel plane so that the mechanism is non-wedging. Ample jacket space surrounds the port openings as well as the body, providing extensive heating surface and correct temperature to insure fluidity of the materials being handled. The steam or other heating medium can be connected to the jacket at either side of the valve. *Everlasting Valve Co.*



IT'S NEW ✓ CHECK IT

(4) NEW NIL-PRESSURE ACTUATED SWITCH, is for use as a safety measure or as a positive control of electro-mechanical devices by fluid pressure. The new unit is used to actuate or prevent a specific operation until the system pressure decreases to practically nil. The unique feature is a pressure-response element that operates an electric switch at a pressure as low as 0.1 in. of mercury above ambient and yet withstands a static pressure of 150 psi. Use of a relay and micro switch confines the load on the micro switch to the current required to actuate the relay. *Meletron Corp.*

IT'S NEW ✓ CHECK IT

(5) AUTOMATIC PIPE HANDLER handles and racks drill stem, casing, and tubing during well-drilling operations. Unit is composed of a pipe trough, track and skids, lever arms, power mechanism, and automatic load and unload devices. Rig is easily operated by one man. Pipe is racked in conventional manner. As joint is needed, loader control valve is opened and a joint rolls into trough of handler. Next power supply for handler

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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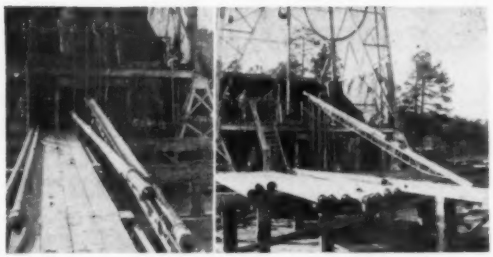
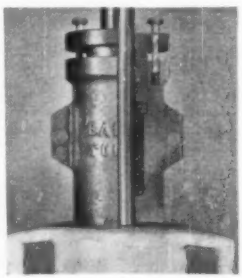
OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT



is released and the trough is elevated as illustrated. This action raises joint over and above derrick floor where a convenient connection can be made. Pipe can be returned to the rack in a similar manner. Safety and ease in handling are prime features of the mechanism. *King Tool Co., Inc.*

IT'S NEW CHECK IT

(6) POLISHED ROD LUBRICATOR, lubricates the polished rod or liner after the well heads up and flows, after the well is pumped off; prevents oil from being sprayed or wind blown if stuffing box rubbers let go. This lubricator is packed with graphite which has been known for years as one of the most successful dry lubricants available since it is unaffected by water and most acids. This unit is an excellent precaution for electrified time-clock pumping units which pumper does not regularly check. *Baird Manufacturing Co.*

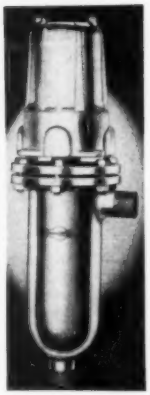


IT'S NEW CHECK IT

(7) ROLL-AROUND SAFETY cage for tank painting, cleaning, inspection and general maintenance work provides an entirely new method of tank maintenance plus an unusually high degree of safety for this type of work. Roll-Around safety cage is made of heat-treated aluminum alloy and is stronger than structural steel yet one-third the weight. It is easily carried by one man to the top of the tank. Casters can be locked whenever desired to prevent rolling. The exclusive arched support construction permits free movement. The caster wheels are widely spaced to prevent the cage from being whirled by the wind. The casters are mounted on adjustable legs which can be adjusted to position the cage the distance desired from the tank surface. *Up-Right Scaffolds.*

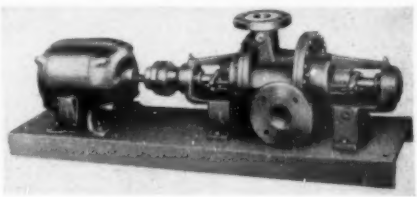
IT'S NEW CHECK IT

(8) MAGNETIC PROXIMITY FLOAT SWITCH is especially designed for heavy-duty industrial service. This float switch is distinguished by its simplicity and absence of conventional packing boxes, bellows, or diaphragms. Standard Type H units feature standard or explosionproof cover, forged-steel body, stainless-steel float, and noncorrosive switch unit. Models are available for internal pressure ranges from vacuum to 600 psi. and temperatures to 700° F. Higher-pressure controls are made to order. These units are suitable for use with a wide variety of liquids of .55° specific gravity and upwards. Units for fluids below .55° specific gravity are made to order. *Magneswitch, Inc.*



IT'S NEW CHECK IT

(9) WATER-JACKETED TURBINE-TYPE PUMPS. This line of single and two-stage water-jacketed turbine-type pumps is designed with extra deep stuffing boxes for the handling of high-temperature and highly volatile liquids. The water jacketing offers notable performance on high-head, small-capacity duties, will not vapor bind, hydraulic balance, no metal-to-metal contact within the pump, practically constant capacity over wide head variation. The water jacketing and deep stuffing boxes reduce the temperature of any liquid leakage, thus preventing flashing or vaporizing of the leakage upon reaching the atmosphere. *Aurora Pump Co.*



IT'S NEW CHECK IT

(10) CABLE-TOOL SWIVEL HOOK is only 28 in. long from center of clevis pin to hook, has ball-bearing swivel and forged steel construction. Its capacity is 30 tons. It is of extremely short and compact design, saving space in handling pipe and casing. Wide center permits straighter in-line pull from links to elevators and use of short elevator links. Can be adapted to any size blocks by changing swivel links. Field proven by use on cable-tool rigs landing 13 ⅜-in. casing. *Superior Oil Tool Co.*

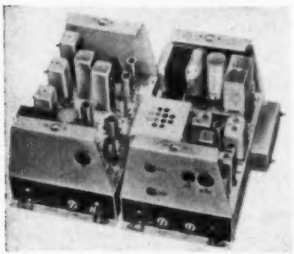
IT'S NEW CHECK IT

(11) LIGHT-WEIGHT WELDING AND BRAZING TORCH. The torch is all braze construction with rear

end designed for easy hose connections. It converts into a cutting torch by use of WC-10 cutting attachment. *Liquid Carbonic Corp.*

IT'S NEW CHECK IT

(12) NEW MOBILE RADIOTELEPHONE EQUIPMENT for the 152-162 mc. communication band. The equipment features low standby battery drain. The instant-heating transmitter consumes no power from the battery during standby periods; the very-low-drain receiver uses but 4 amp. In combination, the equipment consumes a total of 4 amp. during standby operation, yet permits full performance. This equipment, the FM-47K receiver and FM-177X 15 watt or FM-179X 50 watt transmitter, is ideally suited for oil fields and plant service. *Kaar Engineering Co.*



IT'S NEW CHECK IT

(13) LADDER TRAY AND LADDER STEP hook securely to a convenient ladder rung. A safety innovation, the right tool is at the worker's finger tips, not on the ground or crammed into the worker's pockets. Overhead installation, maintenance or repairs become a one-trip affair. The ladder step conserves energy, eliminates fatigue and perilous ladder-rung balancing, and provides an overhead platform that frees both hands for the job. *Saginaw Bearing Co.*

IT'S NEW CHECK IT

(14) TYPE FFF FOGFOAM NOZZLE is available with foam screen or stream shaper. The model pictured is the FogFoam nozzle without screen or shaper. Shaper or screen attach easily with simple latch mechanism. This equipment will enable fire fighters to extinguish large spill fires in gasoline with speed and with economical use of foam. Nozzle is available for ordinary 1½, 2½, and 3½-in. hose lines and turret guns. *Rockwood Sprinkler Co.*

IT'S NEW CHECK IT

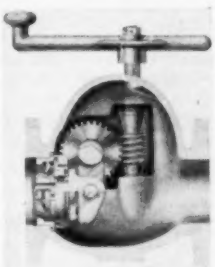
(15) HOURMASTER. A new mechanical hour recorder records the number of hours any piece of machinery, or equipment with moving parts, has been operated. The Hourmaster converts revolutions per minute, from 1 to 4,000, into hours of operation. Entirely self-contained, it is a carefully designed, ruggedly built, mechanically operated instrument. Space is provided for record cards which can be used to accumulate service, production, or maintenance records. Each instrument adds up to 100,000 hours of operation and requires practically no service or maintenance. *Barbour Stockwell Co.*

IT'S NEW CHECK IT

(16) SLUSH PUMP RELEASE VALVE. This new quick-opening slush pump release valve has been field tested under extreme conditions by a number of contractors. The valve construction of this device permits rapid and convenient opening under high-pressure conditions without incurring danger of injury to the operator. Construction of the valve provides means for sealing the fluid under high pressure and is not subject to erosion and cutting action ordinarily caused by leakage of high velocity abrasive fluid. *Drilling Equipment Manufacturing Co.*

IT'S NEW CHECK IT

(17) MAC BAIN "POSITIVE SHUTOFF" VALVE. The valve is engineered to high-quality standards with low maintenance cost as one of its major features. Basically it is a check valve with main and primary seats and disk, worm and gear driven to provide positive control in opening and closing. Torque thus applied enables the valve to open easily against rated pressures with manual control in closing. Other important features include a double-seal disk and seats which allow the operator to throttle or close the valve without shock. Special synthetic rubber seals positively seal tight, and stay tight under extreme conditions. *Tork-Master Co., Inc.*



IT'S NEW CHECK IT

(18) MILLER ANGULAR THRUST BALL BEARING SWIVELS. These ball-bearing swivels are used in several ways on strung blocks. Miller swivels combined with the hook make it possible to turn loads independently of the block. Complete assemblies are available combining the Miller swivel with various sizes of blocks and hooks, or the swivels can be inserted in blocks now in use and can be obtained in a wide range of capacities, handling up to 23-ton working loads with a safety factor of more than 5 to 1. *General Machine & Welding Works.*

TRADE LITERATURE

(19) CONDENSED GENERAL CATALOG. A 58-page book, perforated for binding, carries specifications and illustrations of the complete line of oil-field equipment manufactured by the company. *Black-Sivalls & Bryson, Inc.*

(20) STEAM TRAPS details, dimensions, weight, valve orifice, construction, material, capacities, and applications for each type of trap offered. *W. H. Nicholson & Co.*

(21) SOMETHING NEW IN GLOBE, ANGLE AND CHECK VALVES is a three-color folder covering the special features of valves manufactured by this company. *Lunkenheimer Co.*

(22) RADIO, ELECTRONICS, AND TELEVISION. This 1949 catalog lists a multitude of complete units and parts used by electronic and communications engineers. *Walter Ashe Radio Co.*

(23) NO. 2700 PRESSURE CONTROLLERS illustrates and describes applications as well as the versatility of this type of control. *Mason-Neilan Regulator Co.*

(24) FULBORE describes a method of cementing and equipment and includes detailed diagrams of each piece of equipment. *Rector Well Equipment Co., Inc.*

(25) WORKING BARREL AND PLUNGER BARREL. This pocket-size folder gives detailed information and illustrations, along with special features of the equipment. *McGregor Working Barrel Co., Inc.*

(26) DIESEL DEVELOPMENT IN THE UNITED STATES, a paper presented by R. N. Tate, application engineer, engine sales division, at a meeting of the National Association of Power Engineers on November 18, 1948, at Indianapolis. *Worthington Pump & Machinery Corp.*

(27) BELL-PACK SLEEVE describes a light, easy-to-install, repair sleeve for broken or split bells and leaking joints on gas and water mains. *Dresser Manufacturing Division.*

(28) MULTI-SURGE JUNK SNATCHER, a four-page illustrated folder describes a hydrostatic, multiple-action fishing tool that runs with drill pipe or tubing. *Cavins Co.*

(29) ASPHALT INSTITUTE QUARTERLY, the first issue of a free, controlled-circulation magazine describes developments in the applications of asphalt in road and airport construction. *Asphalt Institute.*

IT'S NEW ✓ CHECK IT

(30) THE STORY OF STEEL PIPE covers the production and fabrication methods employed in the manufacturing process of steel pipe. *Steel Products Division, Basalt Rock Co., Inc.*

(31) HEAT WHERE YOU WANT IT is a series of brochures covering the major uses of tubular, strip, and cartridge heaters in industry issued in connection with 35-mm. sound slide film. The five brochures cover such subjects as "Heating Pipe Lines," "Heating Process Air," "Melting Soft Metals," "Heating Liquids," and "Heating Surfaces." *General Electric Co.*

(32) KONTOL CORROSION PREVENTIVES is descriptive of corrosion inhibitors developed for many oil-field applications. The 12-page illustrated booklet includes diagrammatic sketches for each application. *Tretolite Co.*

(33) SYNTHETIC ORGANIC CHEMICALS. This brochure contains the latest series of Celanese Specifications Bulletins, giving practical data on chemicals currently in volume production. *Celanese Corp. of America.*

(34) STRONG STEAM SPECIALTIES CATALOG NO. 68A. Completely revised in two colors, this 32-page book carries information on a complete line of steam specialties: traps, strainers, reducing valves and separators. *Strong, Carlisle & Hammond Co.*

(35) DATA ON CROLOY STEELS READY. A convenient reference card on stainless Croloy steels for tubing, giving standard type numbers by which grades are identified and chemical composition limits and ranges, based on ladle analyses. *Babcock & Wilcox Co.*

(36) AUTO-AIR COMPRESSORS. The bulletin contains specifications of 60-105-160-210-315-cu. ft.-per-minute truck-mounted units. It lists the various body types available and contains illustrations of 10 typical assemblies. *Davey Compressor Co.*

(37) NEW CATALOG J describes not only the wide range of instruments and accessories available, but also gives information about applications, manufacturing methods, and other pertinent matters. *Nuclear Instrument & Chemical Corp.*

(38) FORCE-BALANCE LIQUID LEVEL TRANSMITTER. A new four-page bulletin gives a clear and concise presentation of a liquid-level transmitter which is specifically designed to measure pressure and liquid level of viscous or corrosive liquids and liquids containing solids. *Taylor Instrument Cos.*

(39) H & B CASTABLE, versatile "mix and pour" refractory, is fully described in this new sales bulletin. *Walsh Refractories Corp.*

(40) CORROSION-RESISTANT PIPING MATERIALS. The 32-page booklet contains descriptions and information on the complete line of valves, fittings, fabricated piping, and pipe coils to meet a wide range of corrosive conditions. *Crane Co.*

IT'S NEW ✓ CHECK IT

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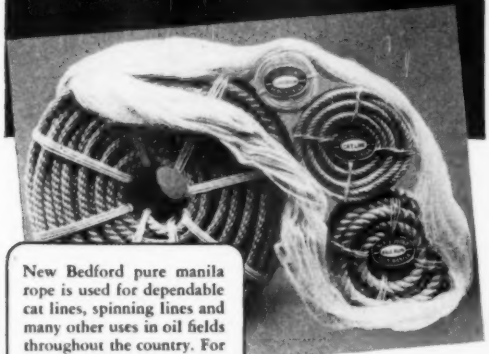

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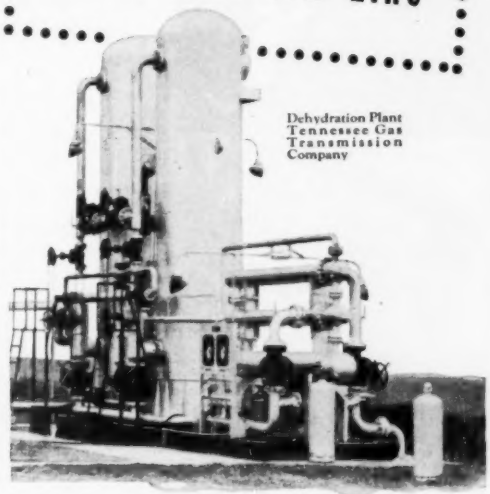
NEW BEDFORD MAKE BETTER PURE MANILA

Florite Dries Natural Gas on a Transmission Line



Dehydration Plant Tennessee Gas Transmission Company

AN INTERESTING use of a Floridin product is that of the Tennessee Gas Transmission Company at a compressor station on its main line at East Bernard, Tex. Twin adsorption towers filled with Florite serve alternately to dehydrate gas from local sources before it is admitted to the main line. While one tower is active, the other is being reactivated by means of a heating unit and a heat exchanger; and thus uninterrupted service is maintained. A Bureau of Mines dewpoint instrument is used for checking the efficiency of the adsorption bed.

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Houston - Tulsa

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General Contractors
Oil Gas Gasoline Water Pipelines
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L. H. Favrot — G. A. Peterkin —
J. W. Sharman — R. P. Gregory

PIPE LINES

Trunkline Construction To Start Next Year

CONSTRUCTION will begin July 1, 1950, on Trunkline Gas Supply Co.'s 711-mile, 26-in. natural-gas trunk line from Edge, Tex., to a connection with Northern Natural Gas Co.'s system at Palmyra, Neb. In accordance with terms of Federal Power Commission's authorization, the project will be completed in October 1951.

This $84,000,000 project also includes the laying of 810 miles of lateral feeder lines to fields in Texas and Louisiana. There will be seven compressor stations with a total of 44,800 hp. for transmitting 250,000,000 cu. ft. of gas daily to Northern Natural.

Trunkline is preparing to negotiate a contract with Michigan-Wisconsin Pipe Line Co. for delivery of 100,000,000 cu. ft. daily, according to J. MacDonald Biddison, vice president and consulting engineer of Trunkline. Earlier arrangements called for delivering this gas to Michigan-Wisconsin in eastern Iowa. Mesabi Pipe Line Co. has been negotiating with Trunkline for gas deliveries to commence at the rate of 50,000,000 cu. ft. and to increase to 100,000,000 cu. ft. daily in 15 years. The Mesabi program will depend on the scale of plants for beneficiation in connection with iron-ore operations in Minnesota. For extensive beneficiation of low grade ores it is reported that natural gas has economic advantages which make it preferable to oil.

Financing arrangements and the selection of an engineering firm to design and supervise construction of the project are not expected to be announced until July, according to Biddison. At that time the location of the headquarters from which operations will be directed may be also announced. At present, company headquarters are at the office of the president, Ralph K. Davies, 111 Sutter Street, San Francisco.

In approving the project, the commission selected the Edge-to-Palmyra route in preference to an alternative proposal which would have involved a main pipe line running approximately 200 miles farther east between Lake Charles, La., and Keokuk County, Iowa. Selection of the westerly route, the commission pointed out, will mean a saving of over $5,000,000 in Trunkline's estimated construction costs and a saving of nearly $3,000,000 in construction work which will have to be performed by Northern Natural.

One of the collateral questions raised in the proceeding by some of Northern Natural's utility customers was whether Northern should charge a separate rate for gas received from Trunkline or a single "rolled-in" rate covering the gas received from all its sources of supply. Since this was not strictly an issue in the proceeding on Trunkline's application for a certificate, the commission did not directly decide the question. It did, however, express the opinion that "Northern should continue its present practice of charging a uniform . . . rate for all sale-for-resale services on its main-line system after it commences its purchases of gas from Trunkline."

Contract demands for gas on Northern Natural's system, the commission said, are expected to be well in excess of 530,000,000 cu. ft. projected daily capacity of that system and will exceed that capacity in the third year of operation of the Trunkline project by approximately 281,000,000 cu. ft. per day if a single "rolled-in" rate is adopted.

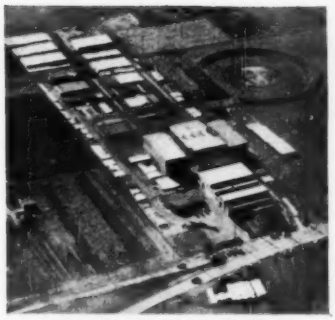
San Juan Pipe Line et al Hearings Set for May 31

Hearings have been scheduled by the Federal Power Commission for May 31 in Washington on a proposal involving construction of natural-gas pipe-line facilities which would carry 165,000,000 cu. ft. of gas daily from the San Juan Basin in New Mexico, Colorado, Utah, and Arizona to markets in northern Arizona and the San Francisco Bay area.

The proceedings, consolidated by FPC order, are concerned with applications filed by El Paso Natural Gas Co., San Juan Pipe Line Co., and Pacific Gas & Electric Co.

El Paso is proposing to build a 451-mile pipe line from the San Juan area to a point on the Arizona-California border near Needles, Calif., with six branch lines extending to the Arizona communities of Winslow, Flagstaff, Williams, Seligman, Prescott, and Kingman. The plan calls for delivery of available gas to the Arizona communities and for P. G. & E. to receive 150,000,000 cu. ft. per day at the Needles connection for transportation to the bay area.

Construction of this 451-mile line originally was proposed last summer by San Juan, which is an affiliate of



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El Paso. However, El Paso subsequently filed an application proposing to construct the facilities as part of its own system.

P. G. & E., to enable it to handle the 150,000,000 cu. ft. to be delivered by El Paso, is seeking FPC authorization to increase to 400,000,000 cu. ft. the daily capacity of a pipe line authorized by the commission last March. FPC at that time also authorized El Paso to construct facilities for delivery from the Permian basin of 250,000,000 cu. ft. of gas per day to P. G. & E. for ultimate sale in central and northern California.

Argentine Crews Finish 60-Mile Section of Line

In the construction of the 1,100-mile, 10-in. line of Direccion del Gas del Estado in Argentina the 59.6-mile section in the area between San Antonio Oeste and General Conesa has been completed.

Pipe was laid in that section across the Rio Negro, which is 985 ft. wide at the crossing. Difficulties were encountered as a result of the extremely rocky terrain and inclement weather.

Pipe laying has progressed at an average rate of 1.8 miles per day with 382 men. In order to speed construction work on the 10¾-in., 1,100-mile pipe line, the job was divided between two spreads. The north section, comprising the Buenos Aires-General Conesa area has been built by the Argentine Government through its department, Direccion General del Gas del Estado. The south section, in the General Conesa-Comodoro Rivadavia area is being laid by the contractor, Cia. Tecnica Internacional.

It is expected that the Comodoro Rivadavia-Buenos Aires pipe line will be finished within a few months. Work on the project started early in 1947.

Cities Service Gas Gets Permit for Compressors

Cities Service Gas Co., Oklahoma City, has been given Federal Power Commission authority to install additional compressor facilities aggregating 4,790 hp. on the company's partially completed 400-mile natural-gas pipe line which will extend from the Kansas Hugoton gas field to Kansas City, Mo. Estimated cost of the new compressor facilities is $1,214,000.

Cities Service also received commission authority to abandon part of its Hutchinson, Kans., compressor station, which the firm said it no longer needed because the partly completed Hugoton-Kansas City line now provides sufficient high-pressure gas to meet demands in the Hutchinson area.

Installation of the compressor units is described by Cities Service as part

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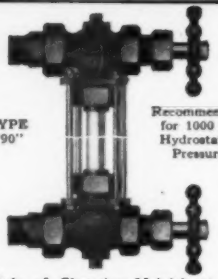

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of a 4-year program for expansion of compressor facilities, as outlined in 1946 when the firm originally asked FPC to authorize the 400-mile Hugoton-Kansas City line.

Hearing Set May 17 on West Coast Gas Project

Hearings will begin May 17 before the Federal Power Commission in Washington on applications of San Diego Gas & Electric Co. and Southern Counties Gas Co. of California for authority to construct jointly an 85-mile pipe line which would increase natural-gas deliveries to the San Diego area by approximately 40,000,000 cu. ft. daily.

San Diego Gas & Electric is seeking FPC authorization to construct approximately 50 miles of the 85-mile pipe line, with Southern Counties proposing to build the remaining 35-mile portion of the project in Riverside County. The over-all line would connect with an existing pipe line of the Southern Counties system near Moreno, Calif., and would extend to San Diego. Estimated cost of the 50 miles of line which would be constructed by San Diego is $3,037,500, while Southern Counties estimates cost of its portion of the project at $1,931,700.

Empire Buys Portion of Phillips Gathering System

Phillips Pipe Line Co.'s crude-oil gathering system in the Johnson and Foster pools of Ector County, Texas, has been purchased by Empire Pipeline Co., a subsidiary of Cities Service Oil Co., according to a joint announcement made by Cities Service and Phillips Pipe Line, subsidiary of Phillips Petroleum Co.

The system consists of approximately 30 miles of pipe line, ranging in size from 2 to 6-in., 34 field pumps, 162 tank connections on 40 leases, a central pumping station having a capacity of 12,000 bbl. daily, and 30,000 bbl. of steel storage tanks.

The system is located in the center of the Foster and Johnson pools near Odessa, Tex.

Pasotex to Connect With Basin System

Pasotex Pipe Line Co., Houston, subsidiary of Standard Oil Co. of Texas, was moving in equipment to lay a 22-mile, 6-in. pipe line from the North Snyder field of Scurry County, West Texas, to a point near Colorado City.

The new line will connect with the Basin Pipe Line System. Standard of Texas, the largest producer in the new field, has been moving oil by truck. Route of the line has been surveyed and right-of-way obtained.

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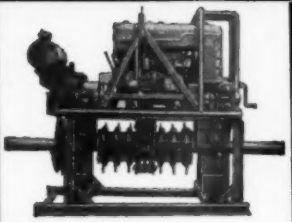

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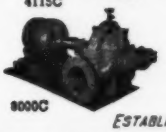
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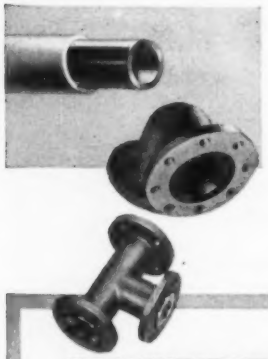

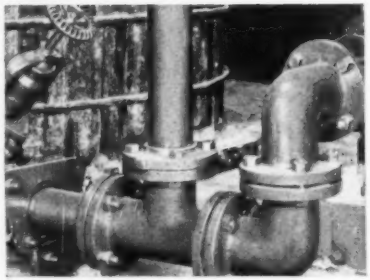

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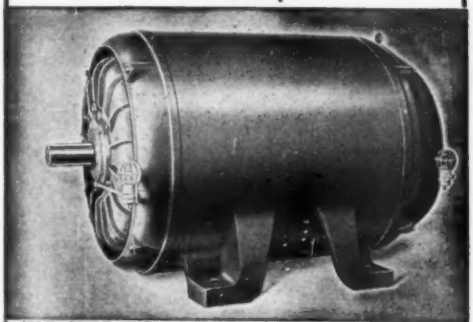

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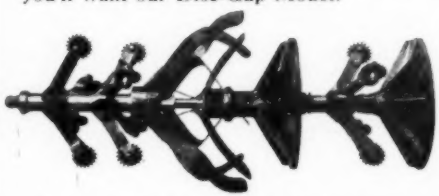

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NATURAL GAS

Authorization Granted for Atomic Plant Gas Line

Federal Power Commission, in what it termed "acting solely on the basis of strong representations made by the Atomic Energy Commission" has authorized East Tennessee Natural Gas Co., and Tennessee Gas Transmission Co. to build new pipe-line facilities for the purpose of supplying 60,000,000 cu. ft. of natural gas daily to the atomic energy plant at Oak Ridge, Tenn. Under the proposed arrangement, Tennessee Gas Transmission will sell the required quantity of gas to East Tennessee which will resell and deliver it to the Oak Ridge plant.

Facilities authorized for construction by Tennessee Gas Transmission include approximately 155 miles of 30-in. loop lines along its existing system between Central Louisiana and northern Tennessee, as well as the installation of approximately 4,200 additional horsepower at compressor stations. Estimated cost is $14,000,000.

The pipe line authorized for construction by East Tennessee will be 22-in. and will extend about 172 miles from a point of connection with Tennessee Gas Transmission's line eastwardly to the Oak Ridge plant. Estimated cost of the project is approximately $9,400,000.

Operating Revenues of Gas Companies Up 11 Per Cent

Operating revenues of natural-gas companies reporting to Federal Power Commission amounted to $101,823,412 in February, an increase of 11.3 per cent over the $91,453,570 reported the same month a year ago, FPC disclosed.

Gas utility operating income for February amounted to $24,767,834, up 5.8 per cent from the $23,404,684 reported in February 1948. Net income for the month was $24,753,409, compared to $23,167,786 reported the same month a year ago.

Gas Companies to Invest Heavily in Next 5 Years

BILOXI, Miss.—Approximately $3,300,000,000 in capital investments will be made by the natural-gas industry with in the next 5 years for additional transmission and distribution lines, and to expand production facilities, Winster H. Ligon, Nashville, former president of Southern Gas Association, predicts.

He points out that natural-gas lines now total 250,000 miles, exceeding the nation's railroad mileage.

Proven reserves of natural gas continue to gain, Ligon states, and there is every promise that the industry will be able to meet potential demand for many years to come. He reports that 82 per cent of the natural-gas resources are in the South and concentrated mainly in Texas, Oklahoma, Louisiana, and Mississippi.

Symonds Says Texas Market To Determine Gas Prices

HOUSTON. — The Texas market, and not the interstate transporters, will determine the field price of natural gas in Texas, Gardiner Symonds, president of Tennessee Gas Transmission Co., told those present at the anuual meeting of the Texas group of the Investment Bankers Association of America here recently.

Symonds said that the inflexible law of supply and demand and not conservation will ultimately set the field price of gas in Texas. He said that there is some current speculation concerning rising field prices of gas.

In addressing the group Morgan J. Davis, vice president of Humble Oil & Refining Co., said that the tidelands offered a possibility of furnishing untouched oil reserves needed for national security and civilian use.

Natural-Gas Consumption Continues to Increase

Sales of natural gas during March were 8 per cent greater than the same month in 1948, and sales during the 12-month period ending March 31 were 11.8 per cent greater than those of the same period a year earlier, according to a report by the American Gas Association.

Sales of natural gas to ultimate consumers in March amounted to 2,948,987,000 therms, the report said. A therm is equivalent to 95 cu. ft.

FPC Directs Manufacturers Light to Connect Gas Lines

Manufacturers Light & Heat Co., Pittsburgh, has been directed by Federal Power Commission to connect its natural-gas facilities with those of Waynesboro Gas Co., and to sell and deliver gas to the latter company for distribution in Waynesboro, Pa.

FPC Examiner Edward B. Marsh said the connection and deliveries of gas will neither impair Manufacturers' service to existing customers nor place an "undue burden" on the company, and that an order directing the connection "is desirable in the public interest."

Waynesboro filed its application last August asking FPC to direct Manufacturers to make the connection.

Natural Gasoline

Slaughter Gasoline Plant To Be Dedicated May 14

Dedication ceremonies will be held May 14 for the Slaughter gasoline plant near Sundown, Tex., with William J. Murray, Jr., Olin Culberson and Ernest O. Thompson, memb of the Texas Railroad Commi attending.

The plant is one of a numb built in West Texas to help c the state's natural resources. I extract butane, propane, and natu gasoline from casing-head gas pr duced in the Slaughter field. These products and the dry gas will then be sold for commercial use. All of the propane, and approximately half of the butane produced at Slaughter will be used in West Texas.

The plant is to be operated by Stanolind Oil & Gas Co., for eight coowners. Other owners in addition to Stanolind are The Texas Co., Honolulu Oil Corp., Magnolia Petroleum Co., Devonian Co., Atlantic Refining Co., Saltmount Oil Co., and Mid-Continent Petroleum Corp.

Natural-Gasoline Plant to Be Built by Brazos Gas Co.

Brazos River Gas Co. will construct Palo Pinto County's first gasoline plant, 1¼ miles southwest of Mineral Wells, Tex., according to Norman Hines, vice president of the company.

Homer J. Foley of Mineral Wells is construction superintendent, and will be operating manager of the plant when it is completed.

Gas for the new plant will be collected from Brazos River Gas' wells in Palo Pinto and Jack counties.

L.P.G. Industry Has Good Safety Record, Regulation

The liquefied petroleum industry has one of the best safety records in the country and an excellent system of regulation, Robert E. Poethig, of Chicago, told the group attending the first formal meeting of the newly organized Butane-Propane Institute of Louisiana, at Alexandria, La., last week.

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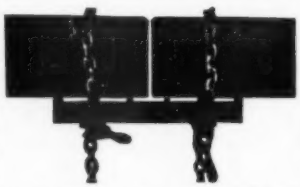

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REFINING

New Automotive Research Laboratory Is Dedicated

BALTIMORE. — A well-balanced program for evaluating motor fuels and oils, present and future, is under way at a new automotive-research laboratory, dedicated last week at Curtis Bay, Md., by American Oil Co. and its affiliate, Pan American Refining Corp. Completely equipped with modern testing tools, the new research installation will provide fuel and oil examination on the basis of actual road performance as well as laboratory analysis.

Recognizing the limitations of fuel testing under laboratory conditions alone, L. W. Moore, Pan American president, stated at a dedication dinner April 27, that the companies were getting down to fundamentals in augmenting such work with road-performance studies involving a fleet of automobiles representing the range of current models. The research program will be progressive in nature, concerned not only with the testing of fuels now marketed by American and its competitors, but with the evaluation of those improved fuels now under development for use in higher compression ratio motor cars of the future.

The scope of proposed work was further outlined by H. C. Smith, vice president of American Oil Co. Routine octane tests of fuels by motor and research methods will be combined with full-scale operation of multicylinder engines and commercial vehicles. These laboratory studies, coupled with road performance tests will furnish data on conditions affecting engine and crankcase deposition, economy, vapor lock, and maximum horsepower. Data compiled under this wide range of operating conditions will be studied in the future in an effort to interpret laboratory finds more accurately as functions of actual road performance in customers' cars.

Transparent Bubble Tower Aids Fluidynamics Research

This full scale lucite section of an experimental bubble tower is the latest tool to be used in a continuing research program on "fluidynamics" conducted at Jersey City by chemical and refinery engineers of M. W. Kellogg Co. The studies, initiated in 1935, are being intensified with the object of designing towers of smaller diameter affording the same, or greater, throughput efficiency provided by present designs.

Visual observation of a wide range of operating conditions is augmented by stroboscopic photographs similar to the one above which "stop" the flow of liquid and gas to provide a continuing pictorial record of bubble tray performance. This view shows engineers artificially inducing severe dumping at the right half of the lower tray and excessive entrainment above the left hall. Note how the droplets in the left half are so violently agitated by the vapor that they are running countercurrent to the flow across the plate. Although this may cause good mixing of vapor and liquid, the lack of bubbling and consequent dumping at the right create a serious loss of efficiency. Entrainment of liquid into the top tray also impairs effectiveness of the equipment. Results of these postwar investigations are already incorporated in some recent bubble towers designed and built by Kellogg

Cities Service Awards Compound Plant Contracts

Contracts have been awarded by Cities Service Co. to Sumner S. Sollitt & Co., Chicago, for construction of a $4,000,000 compound plant at Cicero, Ill.

The plant is designed to compound and blend more than 23,000,000 gal. og lubricating oils a year.

Blending stocks will be obtained from a solvent-refined lube-oil plant now being completed at Lake Charles, La., by Cit-Con Corp., owned by Cities Service and Continental Oil Co. Stocks will be barged up the Mississippi and Illinois rivers and connecting waterways.

The plant is scheduled for completion early in 1950.

Antwerp Refinery to Spend $2,000,000 on Expansion

A new construction program, to cost $2,000,000, has been announced by Raffinerie Belge De Petroles S.A. of Antwerp, Belgium, an independent refiner, for the company's Antwerp refinery and fuel-bunkering station at Zeebrugge, Belgium.

As a portion of the project, recent purchases from the Caminol Co., of Santa Fe Springs, Calif., consisted of two gas-oil cracking units, a naphtha-reforming unit, gas-recovery unit, treating unit, and a complete steam plant, together with other auxiliary equipment. Dismantling and reconditioning for shipment to Belgium, and reerection upon arrival at its destination, is being handled by W. M. Barnes Co. of Los Angeles, and it is planned to have the units operating again by late fall.

Complete engineering drawings for reerection, together with modification of some of the equipment for the processing of sour crude, is also being prepared by the Barnes company.

Raffinerie Belge De Petroles S.A. will further expand its Antwerp holdings by addition of a new topping unit.

New Blending, Packaging Plant Opened by Phillips

A new 1,500-bbl. daily blending and packaging plant built by Phillips Petroleum Co. at Kansas City, Kans., was formally opened May 6. The plant can handle 330 gal. of lubricating oil per minute, and blend and ship throughout the company's marketing territory in still drums, cans, and tank cars approximately 158,500 gal. in an 8-hour day.

New installations include lube-manufacturing units for processing of base lubricating oil. Among them are a two-stage vacuum still, two-stage propane fractionation unit, phenol-extraction unit, propane dewaxing unit, and a clay-finishing unit.

Navy Department Studying Work With Jentzsch Tester

The Bureau of Ships of the Navy Department is currently studying results it has obtained with the "Jentzsch tester," developed in Germany and intended for use in evaluating fuels and lubricants. The tester was used on German naval vessels during World War II.

Small in size (about 18 in. square and 12 in. deep), it requires only a small sample of about 5 to 10 ml. of the material to be tested.

The bureau obtained about 25 of the units and has conducted preliminary investigations. It has loaned a number of the units to interested petroleum refiners who desire to determine applicability of the unit to testing petroleum products. These firms are being asked to report results of their experimental testing to the Navy Department.

Flash, fire, carbon, residue, evaporation rate, moisture content, and other determinations can be made with the unit, but its greatest usefulness to date is in the determination of the combustion characteristics of diesel fuels.

German manufacturers of the unit claim that it may also be applied to testing of other fuels, such as gasoline and boiler fuel.

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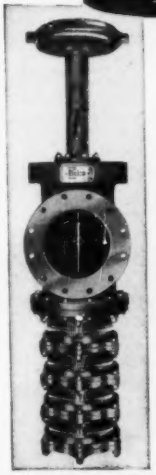

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Among the Drilling Contractors

West Canada Contractors Organize New Association

Organization of a Canadian Association of Oilwell Drilling Contractors has been started. The initial organization meeting, held at Calgary, Alta., was attended by 25 representatives of drilling contractors operating in western Canada. Affiliation of the group with the American Association of Oilwell Drilling Contractors will be sought.

The tentative slate of officers elected to carry the association through its organization stage includes: President, Ralph Will, Drilling Contractors, Ltd.; vice president, Cody Spencer, General Petroleums, Ltd.; secretary-treasurer, Gordon McKay, Commonwealth Drilling Co., Ltd.; directors (in addition to the officers), Tiffin Hetherington, Young Drilling Co.; C. E. Mills, Northern Development Co.; Ralph Binning, General Petroleums, Ltd.; and Archie Miller, Canuck Drilling Co.

V. J. (Tip) Moroney, drilling superintendent, Imperial Oil, Ltd., Calgary, has been one of those most active in planning the association and served as chairman of the initial meeting.

C. E. O'Neal & Co., Evansville, Ind., has contracted to drill another McClosky lime well for Ashland Oil & Refining Co. in the Heusler area, Vanderburgh County, southwestern Indiana. Location is 3 Susie & Effie Bros.

Devon Drilling Co. is rigging up for a wildcat test to be drilled for Pan Western and associates about 5 miles west of Edmonton, Alta., Canada. The location is 9 miles northeast of the Woodbend field.

Commonwealth Drilling Co., Ltd., Calgary, Canada, is starting a contract well for Western-Mineral, Ltd., in the Redwater area, northeast of Edmonton. Location is in LSD 16, 17-57-21w4.

W. C. Patton, Stillwater, Okla., contracting for Thomas N. Berry & Co., has started drilling 2 Kerby, SW NE NW 23-19n-5e, East Ingalls area, Payne County, Oklahoma.

ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area—	May 2 1949	Change over April 25 1949	Change over May 3 1948
Gulf Coast	535	—26	—15
West Tex.-N. Mex.	571	+2	+14
Ark.-N. La.-E. Tex.	148	+9	—5
Oklahoma	251	—15	—61
Kansas	115	—4	—31
Illinois-Eastern	144	+21	+27
Rocky Mountains	105	+2	—46
Pacific Coast	204	+1	+25
Total United States	2,073	—10	—92
Western Canada	81	—3	+38
Total	2,154	—13	—54

*Courtesy Hughes Tool Co.

On the derrick floor of Sun Oil Co. 2 Anderson, west side of the Southwest Antioch field, Garvin County, Oklahoma. Left to right: L. W. Baker, vice president, O'Rourke-Baker Drilling Co., Tulsa, drilling contractor; H. W. Ensminger, driller; V. E. Brandon, Healdton district foreman, Sun Oil Co.; Earl Jones, derrickman; W. D. Tidwell, motorman; E. M. Wollard and W. I. Ruggs, floormen

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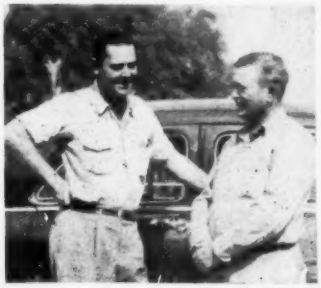
Corpus Christi

C. G. Glasscock Drilling Co. is owned by C. G. Glasscock, Sr., his son, C. G., Jr., and James C. Storm. The senior Glasscock, who organized the company and later took his son and Storm into partnership, has been a contractor since 1925. He started in



C. G. Glasscock, Sr. (right), and C. G. Glasscock, Jr.

the oil business as a rig builder at Burkburnett, Tex., in 1919. With his brother, Lonnie, he also is an active independent oil operator and producer.

Drilling rigs.—The company currently is operating 6 rigs. Five of these are located in Southwest Texas. They include 2 steam-powered rigs, one with a depth capacity rating of 10,000 ft. and the other 7,500 ft.; 2 diesel-powered rigs, one rated at 11,000 ft. and the other 10,000 ft., and 1 butane rig with a rating of 15,000 ft. The other rig, a 7,500-ft., diesel-powered assembly, is in North Texas. In addition, the company has under construction a 155-ft. by 52-ft. by 11-ft. drilling barge.

Key personnel.—In addition to the owners, Lee McMillian is production superintendent; "Rusty" Cunningham, Ray Ford and Russell Saunders are toolpushers; D. W. Streety is diesel engineer, and Jack Daigle, mud engineer.

Discoveries.—Among the more important discovery wells drilled by the company were those of the West Ranch field, Jackson County, and the East Long Mott field, Calhoun County, both on the Texas Gulf Coast.

Production.—The company has production of its own in the East Texas field and in the Saxet, Aqua Dulce, West Ranch, East Taft and East Long Mott fields, Texas Gulf Coast.

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Exploration and Drilling

A New Pennsylvanian Hit for Lea County N. M.

NORTHERN Lea County, New Mexico, and the basin between the Central Basin platform on the south and the Red River (Matador) uplift on the north, is back in the limelight with another Pennsylvanian discovery. Magnolia Petroleum Co. 1 Betenbaugh, SW SW 12-9s-35e, flowed 35 bbl. per hour of 46.9° gravity crude on a 4-hour drill-stem test.

The new success lies 3 miles north and 4½ miles west of the discovery well in the Crossroads field, which was opened just about a year ago in the Ellenburger (some call it Devonian). It probably lies on the south flank of the Red River uplift.

With surface elevation of 4,130 ft., the well was drilling in a Pennsylvanian lime and cores at 9,623-40 ft. showed oil signs, stain, and odor, in vugs and secondary crystals. It was believed to be in about the same section of the Pennsylvanian as that which showed signs of big production in the Amerada Petroleum Corp. 1 BTA State, NW SE 2-12s-33e, about 20 miles southwest.

A drill-stem test at 9,591-9,641 ft. (corrected depth), with 1,080-ft. water blanket, brought mud to the surface in 22 minutes, water blanket and gas in 24 minutes, and oil in 50 minutes. After the well was turned into tanks, the hourly gages were: 35.16, 32.04, 35.16, and 36.52 bbl. through 1-in. bottom choke and top chokes that were varied from ⅝-in. to 1-in. The gas-oil ratio was 1,818 cu. ft. per bbl. Flowing pressures varied from 1,250-1,500 psi., and shut-in pressure built up to 3,550 psi. in 15 minutes.

A string of 7-in. pipe was cemented at 9,641 ft., total depth. The plug was drilled and casing perforated with six shots per foot at 9,617-35 ft. Last reports had operator preparing to run tubing and make production tests.

The pay is probably a reef-type limestone, somewhere in the Upper or Middle Pennsylvanian; at least it is not likely to be Lower Pennsylvanian. As little is known about Pennsylvanian correlations in this region, the above is as far as geologists are prepared to commit themselves right now.

The pay did not show much kick on the electric log, and just possibly might have been passed up had it not been for the results in the Amerada well previously mentioned. It is reported that some of the wells in Crossroads field will now be rechecked and tests made of this section of the Pennsylvanian. It is also reported that Magnolia 1 Cox-Federal, SW SW 12-9s-36e, just 6 miles east, a wildcat which has been testing the Ellenburger on what is presumed to be a structure separate from Crossroads, will be tested in the Pennsylvanian.

This new strike confirms the importance that geologists have been assigning this area ever since the first discovery at Crossroads. *(For previous references on exploration in the area, see The Oil and Gas Journal, May 13, 1948, page 443; February 10, 1949, page 125; March 17, 1949, page 207; and April 28, 1949, page 163.)*

For southeast New Mexico, the new strike simply adds more fuel to interest in the Pennsylvanian, both on and off the Central Basin platform. It is only about 9 months since the first Pennsylvanian production was found in southeast New Mexico. *(See The Oil and Gas Journal, August 26, 1948, page 181.)* Taken in conjunction with the discovery of production in the McKee sand of the Simpson in December, it means that interpretation of logs for kicks must be studied more carefully. *(See The Oil and Gas Journal, December 23, 1948, page 97.)* There seems to be a lot of oil in that pre-Permian that has to be watched for with an eagle eye, if it isn't to be passed up.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN AREA.—Continental Oil Co. recovered 4,800 ft. of oil on 35-minute drill-stem test of its 3-mile extension southeast of the Sussex field, and the well may be rated as a discovery. Superior Oil Co.'s new depth record well is now below 19,654 ft., and will apparently go below 20,000 ft. before completion. At Glasner Dome, Wyoming, Southern Production, Inc., found water in the Tensleep and has been plugged back for tests of the Phosphoria. British-American Oil Producing Co. is preparing to test its apparent discovery at Clark Fork, Montana, in the Phosphoria formation.

SOUTH LOUISIANA.—Another offshore discovery has been completed in Vermilion area. Superior Oil Co. C-1 Gulf of Mexico, State Lease 1106, Block 76, flowed an estimated 5 bbl. of condensate in 3 hours and at the rate of 2,922,000 cu. ft. of gas per day with flowing pressure on tubing at 2,935 psi., through perforations at 7,415-7,430 ft.

PERMIAN BASIN.—According to latest reports, Magnolia 18-B Cowden, test 2 miles southeast of Dollar Hide field in Andrews County, on last drill-stem test made (11,035-85 ft.) recovered 10,100,000 cu. ft. of gas, 450 ft. of oil and gas-cut mud, and 5,680 ft. of free oil. Additional Strawn production for Scurry County, 1½ miles east of North Snyder Canyon field, was reported at J. L. Collins 1 G. E. Parks, in Section 442. A drill-stem test at 7,308-22 ft. had flowing oil in 24 minutes, estimated at 25-50 bbl. hourly. Location of the 1 Parks is about 3½ miles northwest of Placid Oil Co. 1 Early, which completed this week for 291 bbl. of oil a day from the Strawn at 7,520-45 ft. The Strawn in the Parks well is believed to be about 150 ft. higher than in the 1 Early.

CANADA.—New D2 (Devonian) production has been found approximately 70 miles south and 40 miles east of Leduc. Gulf 1 Ellis, LSD 4, 10-38-20w4, near a 1948 failure, flowed oil 59 minutes after tester was opened on drill-stem test at 5,180-5,200 ft.

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TEXAS GULF COAST

Gulf Gets Discovery In Peach Point Field

HOUSTON—Potential flow gage has been made at Gulf Oil Corp. 1 S. S. Perry et al, a wildcat discovery for the Peach Point field in Brazoria County, located in S. F. Austin 7½rd League, Abstract 20, 4 miles northeast of the old Allen Dome. Drilled to a total depth of 12,984 ft., with 5-in. liner cemented from 10,800-11,456 ft., the well was completed through perforations at 11,278-11,348 ft. in the lower Frio sands, using a 10/64-in. choke, for an initial production of 34.34 bbl. of 44.2°-gravity condensate per day with 4,255,000 cu. ft. of gas. Gas-condensate ratio was 123,919, open flow calculation being 35,000,000 cu. ft. daily. Flowing pressure on the tubing during the test was 7,890 psi., and the well now is shut in with 8,100 psi. pressure.

Amerada Petroleum Corp. 1 H. A. Godejohn, a discovery gas-condensate well in the Fostoria area of Montgomery County, is reported to have made approximately 1,700,000 cu. ft. of gas per day and some 61°-gravity condensate through a ⅜-in. bottom and ¼-in. top chokes. Maximum flowing pressure was approximately 1,650 psi. Well now is shut in awaiting a potential test. This discovery is in the M. B. Lawrence Survey. Total depth is 13,691 ft., with perforations in the upper Cockfield 5,624-5,633 ft.

Mission Valley field, Victoria County, has been extenced to the southwest by Western Natural Gas Co. 1 O. W. Schaefer. On drill-stem test through perforations at 8,451-56 ft., open 23 minutes, using ¼-in. chokes, recovered 150 ft. of oil and 270 ft. of oil-cut mud. Total depth is 8,713 ft. with 5½-in casing set on bottom. Operators are continuing to test. This well is in W. J. Eaton Survey, Abstract 164.

Magnolia Petroleum Co. 1 Block 85 Unit, wildcat in Live Oak County, is completing for a gas-condensate producer through perforations at 7,845-79 ft. Total depth is 7,524 ft., with 7-in. casing set on bottom. The well is cleaning through a 7/32-in. choke with 1,733 psi. working pressure, with shut-in pressure recorded at 2,557 psi. This well is 6 miles south-southwest of Simmons City, on Tract 3627 of Block 85, Dr. C. F. Simmons Subdivision.

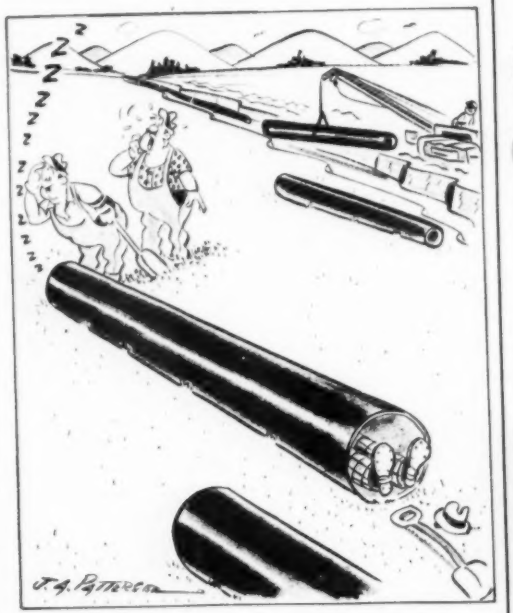
TEXAS GULF COAST (DISTRICTS 2 & 3) SUCCESSFUL WILDCATS

Brazoria County: New gas-condensate discovery, Peach Point—Gulf Oil Corp. 1 S. S. Perry et al, S. F. Austin 7½rd League, Abst. 20, 7 mi. SE Brazoria, 4 mi. NE old Allen dome, TD 12,984 ft., top sand 11,278 ft., lower Frio, perf. 11,278-11,348 ft., IP: 24 bbl. condensate per day and 4,255,400 cu. ft. gas through 10/64-in. choke, GOR 123,919, TP 7,890 psi., shut-in pressure 8,100 psi., gravity 44.2°.

Jackson County: New gas pool—P. R. Rutherford and The Texas Co. 1 Eugene Cihal, I&GN Sur. 5, A-198, 8 mi. NW Ganado, 3½ mi. NE Cordele field, TD 5,516 ft., top pay 2,763 ft., perf. 2,763-68 ft., IP: dry gas well, no gage, TD 1,175 psi., CP 1,200 psi., ¼-in. choke.

Jefferson County: New gas-condensate pool—H. B. Hebert, C. B. Claypool, J. C. Means, Jr., 1 R. Burrell Heirs, B. Blackman Sur., SE Hillebrandt Bayou production, TD 8,761 ft., top sand 8,453 ft., Frio, perf. 8,453-58 ft., IP: 2,010,000 cu ft. gas and 82.5 bbl. condensate per day through a ¼-in. choke, GOR 24,300, open flow estimated 30,000,000 cu. ft. gas per day, TP 2,628 psi., shut-in pressure 2,893 psi., gravity 63.8°.

Lavaca County: New gas-condensate pool—Houston Oil Well Service Co. 1 R. D Ragsdale, James Ryan Sur., A-42, 7 mi SE Hallettsville and 1½ mi. NW Vienna field, TD 8,519 ft., top pay 8,432 ft.,



THE OIL AND GAS JOURNAL

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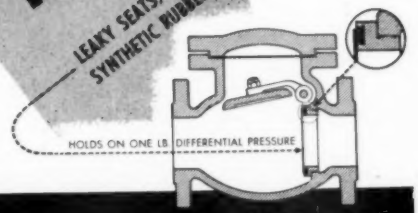

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perf. 8,432-53 ft., IP: gas - condensate well, no gage, TP 1,600 psi. on ¼-in. choke, gravity 52°, no water.

TEXAS GULF COASTS (DISTRICTS 2 & 3) WILDCAT FAILURES

Calhoun County: Salt Dome Oil Corp. and Texas Co. 1 Sarah Little, William Little Sur., Matagorda Island, 14 mi. S Seadrift, dry, TD 6,484 ft.

Southern Production Co. B-1 W. C. Melbourn, F. Albarado Grant, A-1, 1½ mi. SE Magnolia Beach field, dry, TD 9,510 ft.

Jackson County: Rock Hill Oil Co. et al 1 H. A. Meyer, Wm. Menefee Sur., Sandy Creek area, dry, TD 6,300 ft.

Newton County: Callery & Hurt 1 T. E. Inman et al, W. Donaho Sur., A-91, 2½ mi. SE Bon Weir, dry, TD 11,000 ft.

San Jacinto County: Floyd L. Karsten 1 Frank Patton, S. Lusk Sur., Block 50, dry, TD 8,720 ft.

Victoria County: Billy Bridewell et al 1 R. A. Diebel, Polito Castillo League, A-17, 3 mi. NW Bloomington, dry, TD 5,007 ft.

CALIFORNIA

Cuyama Valley Discovery Confirmed by Richfield

LOS ANGELES.—Richfield Oil Corp. has confirmed its discovery of a new major oil field in the Cuyama Valley, Santa Barbara County, by the completion of its 81 Homan, Section 35-10n-27w, which was swabbed in on May 4 flowing at the rate of 5,088 bbl. a day of 32°-gravity oil and 1,500,000 cu. ft. of gas through two 1½-in. chokes. Production is coming from the Dibblee zone in the lower Vaqueros (lower Miocene). After 3 hours the flow was gaged at 1,430 bbl. of 34.2°-gravity oil through ¼-in. choke. The cut was less than 1 per cent. Early this week the well was making 574 bbl. of 34.5°-gravity oil and 212,000 cu. ft. of gas through ⅜-in. choke. Total depth is 4,392 ft. with top of the Dibblee logged at 4,110 ft. Three hundred and forty-nine ft. of 6⅝-in. liner, with 304 ft. of 100 mesh perforated, was landed at 4,390 ft. and 2½-in. tupbing hung at 4,359 ft. with packer at 3,990 ft.

Richfield has made a location for a northerly offset, 88 Machado, 26-10n-27w, and Superior Oil Co. is drilling 18 Buzard et al, 25-10n-27w, as a northeasterly offset.

The new discovery is 5½ miles southeast of Russell Ranch field, a major discovery made in the Valley by Richifeld last June. In the interim, Richfield has completed 73 producers and 22 dry holes in that field and is currently operating 10 strings of tools. Its present daily production is 15,000 bbl. The only other producing company in the field is Hancock Oil Co., which has 1,500 bbl. daily from seven wells. Richfield has just completed an 8-in. line, with a capacity of 35,000 bbl. a day, from the field to its main pipe line in the San Joaquin Valley.

In Kern County, 3 miles west of Greeley field, General Petroleum Corp. has made a Stevens sand (upper Miocene) discovery which may be of some consequence. The company's 38 Kern County Land Co.-Calder, Section 23-29s-25e, has been completed flowing at the rate of 400 bbl. a day of 35°-gravity clean oil through an 18/64-in. choke. Producing interval is 8,815-35 ft. Originally drilled as a test of the underlying Vedder sand, the well was drilled to 12,733 ft., but plugged back to 8,835 ft., where the discovery in the Stevens followed. Production in Greeley field to the east comes from both the Stevens and the Vedder.

Union Oil Co. has extended production in Jacalitos field of Fresno County to the west by the completion of 65 Son, Section 20-21s-15e. The well is flowing about 325 bbl. a day of 37°-gravity oil through 20/64-in. choke.

Humble Oil & Refining Co. has cored oil

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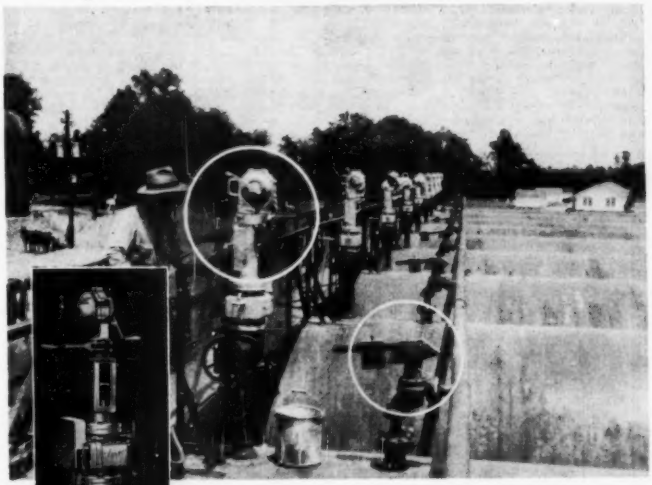

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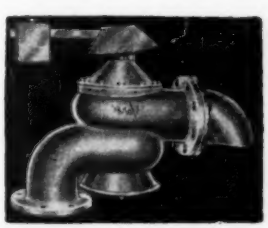

Figure No. 480 Series "VAREC" Pressure and Vacuum Relief Valve, dead weight loaded pallet. Available in sizes from 2 in. to 8 in. and pressure settings to 1 lb. 8 oz. Pressure settings to 60 lbs. available in spring-loaded pressure pallet type, Figure No. 481 Series.

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sand in its 1 T. E. Hammond, wildcat 1 mile southeast of the town of Ojai in Ventura County, Section 18-4n-22w. The company ran formation tester on the interval at 3,900-4,050 ft. with results withheld. Crew is coring ahead below 4,300 ft. Humble entered California in May, 1948, and has since drilled several wildcat wells. If successful, the present test would be the company's first discovery in the state.

Union Oil Co. has embarked on a wildcat play in the Aptos area of Santa Cruz County where it has leased approximately 13,000 acres in a block extending from the Corralitos Creek district northwesterly beyond Hinckley Creek. Its first test well, I Loma Prieta, will be drilled in 19-10s-1e. about half way between Aptos Creek and Bridge Creek.

Further evidence of Barnsdall Oil Co.'s New Allison pool discovery in Guijarral Hills field of Fresno County was given this week when R. S. Lytle, Operator's 48-34F, Section 34-20s-16e, 3,300 ft. southwest of the Barnsdall discovery, flowed at the rate of 2,000 bbl. a day of 36°-gravity oil from 45 ft. of the Allison. Operator will core ahead through the Allison pay and then drill on down for a completion in the Leda zone, principal producing horizon. In the same field, Barnsdall Oil Co. is preparing to complete its 33 Dessel, 2-21s-16e, in the Leda zone. This well is notable for the fact that it has the second largest thickness of oil sand body of any well in the field—325 ft. Top of the Leda was cored at 8,690 ft. and base at 9,015 ft.

Morris-Rothschild Operations has extended West Edison field in Kern County to the northeast by the completion of its 1 Brandt, 22-30s-29e, which is pumping at a 250-bbl. rate, 18°-gravity oil, from 3,026 ft.

The Artnell Co. of Chicago has taken over the abandoned 2 Whepley well of Tide Water Associated Oil Co. on the north dome of Kettleman Hills and will plug back and try for production in the Vaqueros. Tide Water completed the well in 1931 for 6,200 bbl. a day of 34.6°-gravity clean oil, but it gradually went to water and was abandoned in 1942. The Vaqueros is above the original Eocene oil zone.

CALIFORNIA SUCCESSFUL WILDCAT

Fresno County, Guijarral Hills field: Barnsdall Oil Co. 73 Allison, 34-20s-16e, flowed 250 bbl. daily, choke 10/64-in., gravity 38.2°, water cut 1 per cent, elev. 590 ft., TD 8,671 ft. New pay discovery.

CALIFORNIA WILDCAT FAILURES

Kern County, Arvin area: Apex Petroleum Corp., Ltd., 1 Moore-St. Patrick, 16-31s-30e, dry, elev. 513 ft., TD 1,190 ft.

Kern River area: Von Glahn Oil Co. 3 Rodgers, 10-29s-28e, dry, elev. 565 ft., top Kern River Tar sand 820 ft., top Santa Margarita 1,755 ft., TD 1,962 ft.

Tejon Hills area: Ewan Oil Co. 2 Ewan, 11-11n-18w, dry, elev. 1,430 ft., TD 367 ft.

Williams area: Norbel Oil Co. 27 Parkford, 27-27s-19e, dry, elev. unknown, TD 2,610 ft.

Los Angeles County, Placertia area: W. Y. Lee 1 Heil, 32-4n-15w, dry, elev. 1,680 ft., TD 1,435 ft.

Monterey County, San Ardo area: Superior Oil Co. 1 Trescony, 32-21s-9e, elev. unknown, TD 2,465 ft.

Orange County, SE Huntington Beach area: Humble Oil & Refining Co. 1 Clara J Isenor, 25-5s-11w, dry, elev. 45 ft., TD 8,911 ft.

San Luis Obispo County, Cuyama Valley area: Richfield Oil Corp. 38-24 A Joice, 24-11n-28w, dry, elev. 2,036 ft., TD 4,264 ft.

MICHIGAN

Michigan Basin Test May Open New Pool

MOUNT PLEASANT.—With hole filling 1,800 ft. with fluid from the Dundee at a total depth of 3,948 ft., Walter L. McClanahan 1 Rhinehardt, NE NE SW 6-17n-2w, Beaverton Township wildcat, Gladwin County, appeared to be the opener of a potential new pool in center of the Michigan Basin. Dundee top was picked from samples at 3,880 ft. and first oil pay was drilled between 3,930-35 ft. Increases in both oil and gas were logged at 3,943-44 ft. and at 3,945 ft.

After being shut in over night and following partial bail-down, hole still carried 1,150 ft. of fluid. About two bailers of salt water were recovered, but operator and other observers did not place much significance on this water cut.

After 48 hours, the fluid level stood at 1,800 ft. A bottom-hole plastic blanket was run late in the week prior to acidization with 1,000 gal. No report of results of acid treatment were to be available until next week.

McClanahan's new wildcat, drilled in the approximate center of a 5,000-acre drilling block, is located about 4 miles due west of the developed and nearly depleted Beaverton Dundee pool which centered around Section 2-17n-2w.

Gordon Oil Co. 1 Fagan, NE NE SW 28-20n-17w, Grant Township wildcat, Mason County, showed about 200 ft. of Dundee salt water at 1,898 ft., and drilling operations were ordered ahead to the next and probably the final objective, the Reed City-Monroe zone. Dundee top was logged at 1,886 ft.

A small Traverse producer and possible discovery well was completed in Lee Township, Allegan County. Max Spidel 1 Grover, NW SW SE 18-15n-1w, was rated good for 10 bbl. of oil and 5 bbl. of salt water a day after acidization with 500 gal. at a

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total depth of 1,180 ft. Traverse top was checked in at 1,175 ft.

MICHIGAN SUCCESSFUL WILDCAT

Allegan County, Lee Township: Max Spidel 1 Grover, NW SW SE 18-1n-15w, Traverse 1,175 ft., 10 bbl., TD 1,180 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Valley Township: Ohio Oil Co. A-36 U. S. of America CT, SW SW SW 5-2n-14w, Traverse 1,357 ft., dry, TD 1,392 ft.

Barry County, Johnston Township: Clifford A. Perry 1 Bivens, SW SW 14-1n-8w, Traverse 1,920 ft., dry, TD 1,976 ft.

Isabella County, Sherman Township: Chapman Oil Co. 1 Stanquits, N/2 SW NE 4-15n-6w, Stray, 1,440 ft., dry, TD 1,473 ft.

Montclam County, Douglas Township: Union Development Co. 1 Hansen, NW SE SE 2-11n-7w, Dundee 3,429 ft., dry, TD 3,437 ft.

SOUTH LOUISIANA

New Discoveries Highlight South Louisiana Work

NEW ORLEANS. — A new oil field in Acadia Parish has been opened by Callery & Hurt 1 Henry Goss, 13-7s-1e, midway between Bayou Mallet and South Bayou Mallet production. Drilled to a total depth of 8,755 ft., this well was completed through perforations at 8,497-8,503 ft., for an initial production of 180 bbl. of pipeline oil per day flowing through a $\frac{1}{8}$-in. choke. Flowing pressure on the tubing was 1,520 psi.

A new gas-condensate discovery offshore approximately 19 miles from Vermilion Parish, Block 76, Vermilion area, has been completed at Superior Oil Co. C-1 Gulf of Mexico, State Lease 1106, Block 76. This well is located about 9 miles westerly from the Block 71 gas field. Total depth is 11,603 ft., with 9⅝-in. casing cemented to 9,602 ft. for protection. Perforations were made from 7,415-30 ft. for the completion, and through a 14/64-in. choke, the well flowed an estimated 5 bbl. of condensate in 3 hours and at the rate of 2,922,000 cu. ft. of gas per day with flowing pressure on the tubing at 2,935 psi. The well now is shut in with pressure at 2,955 psi. Gas-condensate ratio was 716,176.

The Martex Realization Corp. 1 A. E. White, 14-13s-5w, flowed 160 bbl. of 39.7°-gravity pipe-line oil per day through a 9/64-in. choke to open a new field in Cameron Parish. Flowing pressure on tubing was 1,050 psi., and gas-oil ratio 550. Total depth is 10,642 ft., and perforations are from 6,715-44 ft. This discovery is located 5½ miles east of Grand Lake production.

A new oil pay for the Four Isle Dome in Terrebonne Parish has been opened by Superior 5 LL&E-Unit 12, Section 24-21s-16e. Total depth is 11,827 ft., with 7⅝-in. casing cemented to the bottom. Pipe was perforated in the new pay from 11,140-52 ft., and on late test, the well flowed 327 bbl. of 33.4°-gravity oil per day with 6/64-in. choke for 12 hours and 10/64-in. choke for the next 12 hours. Flowing pressure on the tubing at end of the test was 2,575 psi., gas-oil ratio 1,008.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Cameron Parish: Oil discovery, Mallard Bay Cecil Hagen Co. 1 A. E. White, 14-13s-3w, 5½ mi. E of Grand Lake production, TD 10,642 ft., top sand 6,715 ft., perf. 6,715-44 ft., IP: 160 bbl. oil per day through 9/64-in. choke, GOR 550, TP 1,050 psi., gravity 39.7°.

Terrebonne Parish: New gas-condensate pay, Four Isle Dome—Superior Oil Co. 3 Louisiana Land & Exploration Co. Unit 14, 23-21s-16e, TD 14,564 ft., top

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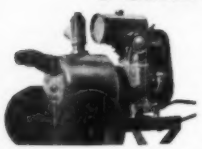

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sand 12,430 ft., perf. 12,430-39 ft. and 12,452-68 ft., IP: 197 bbl. condensate per day and 6,538,000 cu. ft. gas per day through 9/64-in. choke, GOR 34,932, TP 3,600 psi., gravity 47.7°.

SOUTH LOUISIANA WILDCAT FAILURES

Calcasieu Parish: Placid Oil Co. 1 Calcasieu Parish School Board, 19-9s-7w, dry, TD 3,577 ft.

Jefferson Parish: Gulf Refining Co. 2 Louisiana State Lease 1304, Little Lake area, 18s-23e, dry, TD 10,000 ft.

St. Helena Parish: Sun Oil Co. 1 Hattie Dunckelman, 39-2s-5e, dry, TD 9,992 ft.

St. John the Baptist Parish: Hassie Hunt Trust Co. 1 A. Montz, 64-11s-7e, approx. 1 mi. S Laplace production, dry, TD 10,268 ft.

Terrebonne Parish: Hunt Oil Co. 1 Alice Boning Henican, 33-18s-12e, 3 mi. SW Deer Island, dry, TD 13,395 ft.

Vermilion Parish: W. B. Jayred Co. 1 Herbert-SW Louisiana Land Co., 17-12s-1w, approx. 2½ mi. SW Gueyden production, dry, TD 11,002 ft.

ROCKY MOUNTAIN

Sussex Extension Well Runs High to Discovery

DENVER.—Recovery of oil on drill-stem test in the Lakota by Continental Oil Co. at its Sussex, Wyoming, extension well, was considered of importance during the past week. The well is the 5 Unit, SE SW NW 23-42n-78w, 3 miles southeast of the company's discovery well completed last year. Lakota was topped at 7,458 ft., 334 ft. higher structurally than the discovery well in the field. The test was made between 7,459-85 ft., total depth, through ½-in. choke, and the recovery was 4,800 ft. of 42°-gravity oil on 35-minute test. Flowing pressure was 1,150 psi., and shut-in. pressure 3,250 psi. after 10 minutes. The well has a semi-wildcat status because of faulting between the well and the field proper. Continental's discovery flowed 250 bbl. of oil daily, through ¼-in. choke, from the Lakota, but the second well, located between the discovery and the present well, was a Lakota said failure and has been suspended indefinitely after failing to find production through Sundance sand. Following the discovery a year ago, as a result of seismic work in the area, an extensive lease play developed on the western side of th Powder River Basin. Amerada Petroleum Corp. and Union Oil Co. are now drilling a wildcat 15 miles north of Sussex at Smith Cut, and this well is now below 9,000 ft. with objective the Frontier sands at around 12,500 ft. Amerada is preparing to make location for a second wildcat in the general Sussex area, and other operations are reported planning drilling for the area between the Sussex and Salt Creek fields. Sinclair Wyoming Oil Co., American Liberty Oil Co., Sharpless Oil Corp., Carter Oil Co. and others have blocks in the area.

The world's deepest well, Superior Oil Co.'s Pacific Creek, Wyoming wildcat, is now drilling below 19,654 ft. and apparently Superior plans to drill below 20,000 ft. before completion. It is reported the operator has 20,000 ft. of 7-in. casing on the location and will run pipe and perforate for tests of shows reportedly encountered. The well is a tight hole, with no release of information other than drilling depth below 10,000 ft. Good drilling time is reported, with the operator making approximately 50 ft. of hole daily. Other than shows of gas logged at around 12,200 ft., there has been no rumor of developments at the well.

Southern Production, Inc., had disappointing results in its wildcat at 1 Unit, NW NW NE 36-34n-91w, on Glasner Dome, Fremont County, Wyoming, in the Tensleep formation, and the well has been plugged back for tests of the Phosphoria. Tensleep was found at 7,800 ft. and on drill-stem test at 7,800-26 ft., total depth, the well made 1,860 ft. of fresh water with no oil or gas in 26 minutes. The operator has now plugged back to test shows of oil found in the top of the Phosphoria below 7,458 ft.

British-American Oil Producing Co. is now swabbing and cleaning out its Government-McClellan, C NE NE 26-9s-22e, on the Clark Fork structure, Carbon County, Montana, after plugging the well back from Madison. The well was drilled to 9,446 ft., total depth, and made water in the Madison topped at 9,393 ft. On drill-stem tests in the Phosphoria, when the zone was drilled, this well indicated a commercial oil discovery. Phosphoria was topped at 9,030(?) ft., and Tensleep at 9,093 ft. The Tensleep was hard and tight, but cores and tests in Phosphoria were considered similar to the Silver Tip field, 10 miles south, where Seaboard Oil Co. made a discovery last year.

WYOMING WILDCAT FAILURES

North Badger Basin, Park County: Stanolind Oil & Gas 1 NPRR, NW NW NE, 23-48n-102, TD 10,287 ft., dry, Lance 5,184 ft., Lennep 6,212 ft., Bearpaw 6,367 ft., Judith River 6,508 ft., Clagget-Parkman 7,079 ft., Eagle 7,806 ft., Virgelle 7,946 ft., Telegraph Creek 8,020 ft., Cody 8,397 ft., Frontier 9,845 ft., Basal Frontier sand 10,198 ft., Mowry 10,283 ft.

West Mush Creek, Weston County: Trigood Oil Co. 1 Farquet, SW NE SW 26-44n-64w, TD 4,975 ft., Newcastle 4,932 ft.

Newcastle area, Weston County: L. W. Winkler and Son-Conejos Corp. and Phillips Petroleum 1 Federal, SW NE SW 4-44n-61w, TD 1,080 ft., dry, Newcastle 980 ft.

COLORADO WILDCAT FAILURES

Tepee Buttes, Crowley County: Gulf Oil and Colorado Fuel & Iron 1 Unit, SE SE NW 36-18s-56w, TD 7,178 ft., dry, Niobrara 845 ft., Timpas 1,498 ft., Carlisle 1,538 ft., Greenhorn 1,750 ft., Gra-

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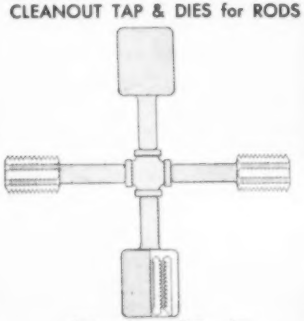

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Olathe area, Montrose County: Wiprud-Vanderpool & Ross 1 Martin, SE NW NE 25-50n-10w, TD 912 ft., dry.

EASTERN TEXAS

Kelsey Dome to Get 6,400-Ft. Test

DALLAS—According to field reports, the Kelsey dome of Upshur County, said to be a perfect structure and dotted with dry holes, was to get another test. Barney Carter, of Tyler, was reported planning a Paluxy wildcat 3 miles west of the Kelsey townsite for his 1 G. F. Langford, 330 ft. out of the northwest corner of a 65½-acre tract in the William B. Mathis Survey. Proposed depth is 6,400 ft.

In Franklin County, 2¼ miles southwest of Hogansport, and about 4 miles northwest of the Mitchell Creek field, R. L. Peveto et al 1 A. Tulley, SP Survey A-467, had prospects of discovery production in Paluxy. Full details had not been reported, but field reports indicated a recovery of some 3,000 ft. of heavy oil, mud and water on a drill-stem test around 4,400 ft. Five-inch casing was set at 4,388 ft. and operators were waiting on cement. Total depth was 4,434 ft. Another drill-stem test report of the Paluxy formation credited the well with yielding 4,000 ft. of oil, mud, and drilling water, estimated to be 25 per cent oil, in 1 hour and 15 minutes.

In Harrison County, Placid Oil Co. 1 Winston, Wm. D. Perry Survey, 3 miles northeast of Lotta, was coring in shale below 8,164 ft. Probable top on the Cotton Valley lime was placed at 7,810-20 ft.

Union Producing Co. 1 Bergin, Travis Peak wildcat in the J. Marshall Survey, 2½ miles south of Gill, was coring below 6,691 ft. No shows had been reported.

Three miles east of Geneva in Sabine County, S. J. Carnes 1 Pickering Lumber Co., F. J. Ballamora Survey, prepared to drill ahead below 6,037 ft. It cored oolitic lime with good odor and fluorescence, some saturation, and broken oil stains throughout from 6,027-32 ft. A 15-minute drill-stem test from 6,025-32 ft., using ¼-in. top and ⅝-in. bottom chokes, recovered 25 ft. of oil, 45 ft. of oil and gas-cut mud and 120 ft. of salt water. Maximum surface flowing pressure was 5 psi., bottom-hole flowing pressure was 100 psi., and shut-in pressure was 2,800 psi. Cores to 6,037 ft. recovered 1½ ft. of lime with fair oil saturation.

EAST TEXAS (DISTRICTS 5 & 6) SUCCESSFUL WILDCAT

Shelby County: Paul H. Pewitt 1-F Pickering Lumber Corp., H. A. Reed Sur., S edge Joaquin field, perforated 4,908-16 ft. in Hill section, flowed 13,500,000 cu. ft. gas daily, rock pressure 1,770 psi., perforated lower Pettit 5,968-92 ft., flowed 2,750,000 cu. ft. gas daily, rock pressure 2,649 psi., TD 6,200 ft.

EAST TEXAS (DISTRICTS 5 & 6) WILDCAT FAILURES

Delta County: Morty Freedman 1 E. A. Derring, H. Ashbrook Sur., 10 mi. NW Ridgeway, dry, TD 4,845 ft., Austin 2,435 ft., Woodbine 3,179 ft. by samples, elev. 548 ft.

Limestone County: Jack W. Frazier and Bill Reiter 1 O. C. Steubenrauch, P. Varella 9 League Grant, 3½ mi. W Mexia, dry, TD 9,157 ft., sample tops: Austin 2,800-10 ft., Goodland 4,689 ft., Paluxy 4,927 ft., Glen Rose 5,014 ft., Massive anhydrite 5,870-83 ft., Pettit 6,366 ft., Travis Peak 6,445 ft., Buckner 8,900 ft., Smackover 9,135 ft., elev. 520 ft.

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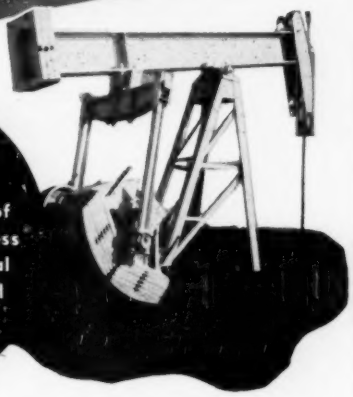

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McLennan County: William F. Collins 1 Irene Hering, Isaac Laver Sur., 4½ mi. SE McGregor, dry, TD 451 ft.

CANADIAN FIELDS

New Strike Indicated Southwest of Stettler

CALGARY.—Canada's latest oil discovery was made by Canadian Gulf Oil Co., subsidiary of Gulf Oil Corp. of Pittsburgh, 6 miles southwest of Stettler and 100 miles northeast of Calgary. The strike, D2 zone Devonian oil (gravity range 35° to 40°), is of considerable importance, but will have to be further evaluated by coring and testing.

The new strike, Gulf N. J. Ellis 1, LSD 4, 10-38-20w4, flowed oil 59 minutes after tester was opened during drill-stem test of interval at 5,180-5,200 ft. A natural gas flow with maximum rate of 500,000 cu. ft. hit the surface 6 minutes after the valve was opened. The well topped D2 zone at 5,097 ft. and has so far obtained around 15 ft. of fair porosity, with no sign of formation water.

Crew is preparing to run 7-in. casing to top of porosity prior to coring and testing at 10-ft. intervals to determine the full potentialities of the D2 zone. If results warrant, the well will likely be placed on production from this horizon, and follow-up drilling will test the lower D3 zone of Devonian for possibilities of production.

Gulf's first venture in this area, Gulf-Jerard 1, LSD 16, 34-37-20w4, about a mile south of the discovery, was drilled as a dry hole over a year ago. This well found D2 zone at 5,226 ft., 156 ft. thick, a little oil staining showed, plus a sizeable porous section that was water loaded. D3 was topped at 5,548 ft., 514 ft. thick, highly porous, but also loaded with water. The findings at Jerard encouraged drilling at the Ellis wildcat at a higher point on the structural feature.

Woodbend.—Production from the D3 zone at Home-Anglo Woodbend 3 assures the well of dual zone success, with an oil flow rated at 67 bbl. hourly from this lower productive zone and also a sizable flow from the upper D2 horizon. During drill-stem test from 5,307-17 ft. in D3, oil flowed to the surface 4 minutes after tester was opened. It produced at the rate of 67 bbl. an hour, with a gas-oil ratio of about 1,000 cu. ft. per barrel. When pipe was pulled, a recovery of 510 ft. of oil and 60 ft. of oil-cut mud was recovered.

The new success, located in LSD 6, 4-51-26w4, is an important link between the 3½-mile undeveloped west portions of the Leduc and Woodbend fields. D3 zone at this key test was topped at 5,198 ft., indicating around 135-150 ft. of section above the water line.

Pipestone Creek.—Sun Oil Co.'s Pipestone Creek Province 1, wildcat in LSD 15, 11-47-24w4, about 7 miles north of Wetaskiwin, reports some encouragement in drill-stem test of D2 zone. A 1-hour drill-stem test of interval at 5,118-37 ft. gave a steady gas flow, plus a pipe recovery consisting of 186 ft. of oil, 118 ft. of gas and oil-cut mud, and 470 ft. of salt water. Drilling is now proceeding below 5,180 ft.

Campbell.—Redwater Leaseholds-Campbell 1, LSD 1, 28-54-25w4, about 12 miles northwest of Edmonton, has encountered the chert band in top of the Viking sand section at 2,966 ft. Cores showed some oil staining. It is planned to core ahead an additional 50 ft., and if promise is shown a drill-stem test will be run. KB elevation at the site is 2,270 ft.

Wildcat abandonments.—Pacific - Sunray & Globe-Bon Accord 1, LSD 16, 17-56-23w4, TD 3,667 ft. Imperial-Pigeon Lake 1, LSD 4, 36-47-3w5, TD 8,405 ft.

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SOUTHWEST TEXAS

New Production Found In Guadalupe County

CORPUS CHRISTI.—New oil production has been opened in Guadalupe County, 9 miles southwest of Luling, by Parker Petroleum Co. 1 Otto Engelkee, in the Harriott Cottle Survey. Drilled to a total depth of 2,215 ft., this well gaged on potential test 138 bbl. of 36°-gravity oil per day on the pump. Production is from open hole at 2,170-2,215 ft. in the Buda lime, topped at 2,166 ft.

Magnolia Petroleum Co. 1 J. A. Murray, extension well 1 mile southwest of the 1 Carlson Unit discovery well at Edinburg gas-condensate field, is completing in the 7,600-ft. discovery pay zone through perforations at 7,587-7,624 ft. With 2-in. tubing set at 7,529 ft., the well cleaned through a ¼-in. choke, with 2,500 psi. working pressure, flowing gas-condensate with no gage. Total depth is 8,607 ft., with 9⅝-in. casing set to 8,606 ft. for the completion. This well is in Porcion 68, 3 miles southwest of Edinburg, in Hidalgo County.

A new oil pay zone for the East Plymouth area of San Patricio County has been indicated at C. G. Glasscock 1 E. N. Tutt, Section 26, fourth addition of Taft Farm lands. On drill-stem test from 5,444-55 ft., open 10 minutes, through ¼-in. chokes, recovered 825 ft. of pipe-line oil, no water, and developed 68 psi. working pressure. Gravity is 30.5°.

In Frio County, M. L. Massingill and I. K. Howeth 1 Rex Shuptrine cored a saturated oil sand in the Navarro zone at 4,616-21 ft. Operators now are running drill-stem test on this zone. This well is located 3 miles northeast of Doering Ranch and 12 miles northwest of Dilley, in the N. Nanez Survey, Abstract 1078.

Coastal Refineries, Inc. and Mayfair Minerals, Inc. 1 O. H. Pagelson, wildcat ¾ mile south of Pharr and just southeast of the McAllen gas-condensate field, Hidalgo County, kicked while coming out of the hole at total depth of 9,400 ft. A ¼-in. choke was put on the drill pipe after closing blowout preventer, and flowed gas-condensate with 2,250 psi. working pressure. The well was killed and operators are drilling ahead below 9,560 ft. This well is in Tract 205, Kelley-Pharr Subdivision.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) SUCCESSFUL WILDCAT

Guadalupe County: New oil pool—Parker Petroleum Co. 1 Otto Engelke, Harriett Cottle Survey 14, 9 mi. SW Luling, SW end of Luling field, top pay 2,166 ft. (Budda lime), TD 2,215 ft., (open hole 2,170-2,215 ft.), IP: 138 bbl. oil per day on pump, no gas, gravity 36°.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Atascosa County: Kirkwood & Morgan, Inc. and Placid Oil Co. 1 Louis Eisenhauer, Diego Perez Sur. 1194, 10 mi. N Charlotte, dry, TD 5,181 ft.

Brooks County: Shell Oil Co., Inc. 1-A Romulo Garza Est., Loma Glanca Grant, 3½ mi. E Falfurrias, dry, TD 8,049 ft.

Duval County: Argo Oil Corp. 2 W. H. Sling et al, BS&F Sur. 117, 4 mi. NE Seven Sisters field, dry, TD 3,184 ft.

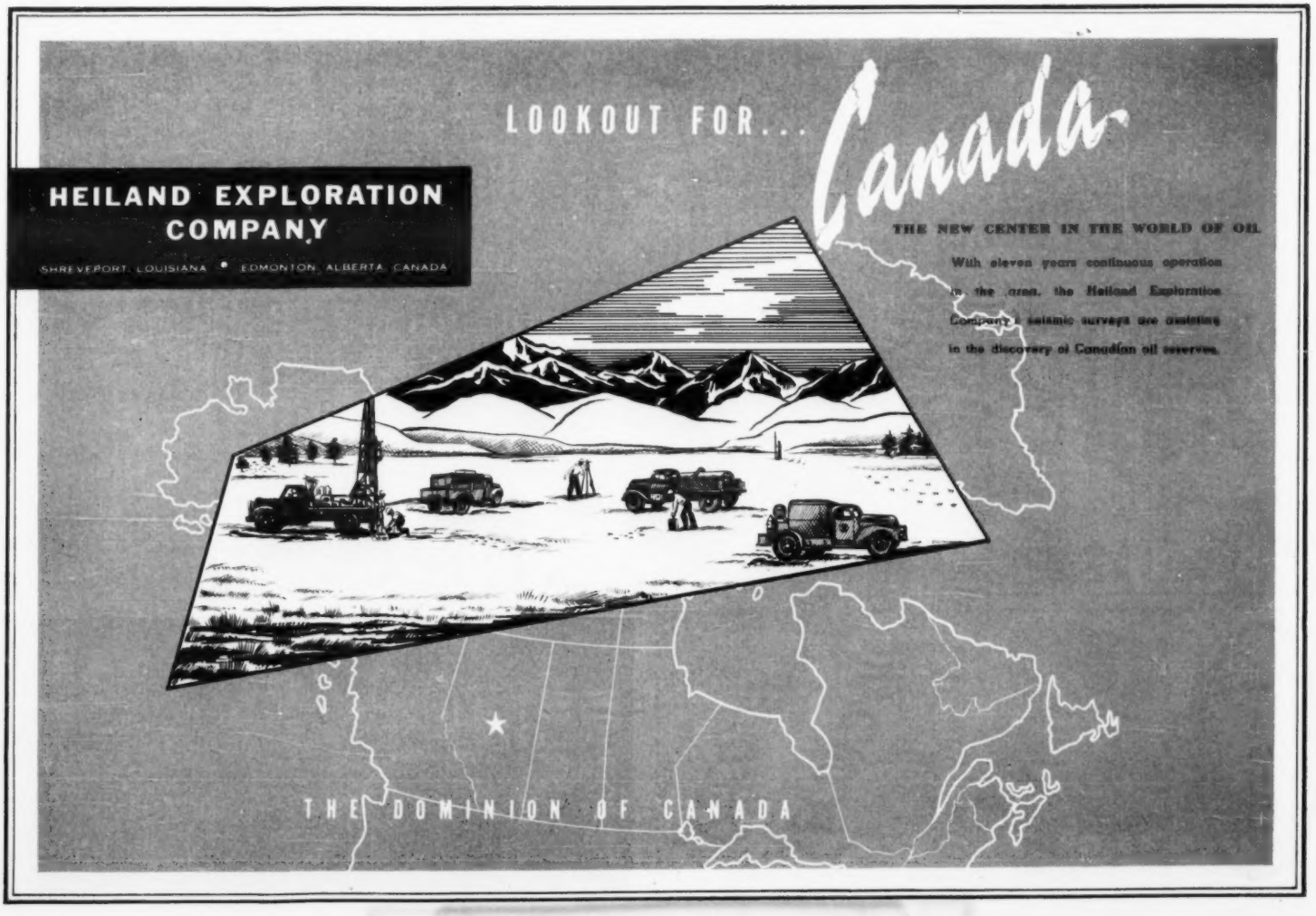
Guadalupe County: Geo. Cabbell & Leuschner 1 Louis Heinemann, in A. M. Esnaurizar League, 7 mi. N Seguin, dry, TD 1,185 ft.

Nueces County: The Union Sulphur Co., Inc., 1 James A. Hill, Jr., BS&F Sur. 162, 1½ mi. SW Saxet field, dry, TD 9,519 ft.

San Patricio County: Southern Minerals Corp. 5 Katherine Clifton, V. Juarez Sur. A-11, 1 mi. NE Mathis, dry, TD 5,200 ft.

Travis County: Joe Hardie 1 E. C. Kreidel, Pedro Rodriguez Sur. 66, 2 mi. W Lund, dry, TD 1,053 ft.

E. R. Marts 1-C B. H. Bloor, Wm. Saun-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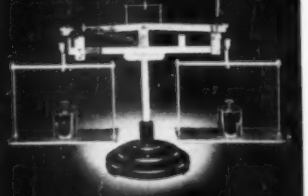

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ders Sur., 2 mi. SW Manor, dry, TD 1,256 ft.

D. B. Scully 1 Schmidt, Pedro Rodriguez Grant 66, dry, TD 1,138 ft.

D. B. Scully 2 Otto Schmidt, Pedro Rodriguez Sur., 1 mi. N Lund, dry, TD 1,138 ft.

N. CENTRAL TEXAS

New Strawn Discovery Prepares for Competition

WICHITA FALLS.—Iowa-Payne Oil Co. 1 N. L. McCleod, 44-19-T&P, northeastern Nolan County Strawn discovery, prepared to plug back for completion from open hole at 5,397-5,413 ft., after finding no shows in the Ellenburger in drilling to 5,735 ft. Apparently no tests were made below the Strawn, although a slight show of oil was logged in the Marble Falls at 5,625 ft. Acid-soluble casing was to be set through the section from 5,126-64 ft.

G. H. Brodie & Hunn Oil Co. 1 J. P. Aycock, Ellenburger discovery 4 miles southeast of Sweetwater in 58-21-T&P, prepared to run additional tests after encountering water in swabbing open hole from 6,156-66 ft. Bottom-hole pressure was 2,637 psi. after being shut in 3 days.

Jack County.—C. G. Glasscock and Pontiac Refining Co. 1 R. L. Morris, J. U. Fields Survey, conglomerate discovery or extension well 2 miles west of conglomerate production in the Chico field of Wise County, ran tubing for additional tests. The wildcat first made a flow of approximately 30 bbl. of oil hourly on a drill-stem test at 5,428-66 ft. First perforations were from 5,458-69 ft., which had gas at the surface in 22 minutes, and apparently became plugged at that time. The tool was open 2½ hours but had no recovery when the tester was pulled. Operators then perforated with an additional 124 holes from 5,438-69 ft. and reran tubing for another test.

Mid-Continent Petroleum Corp. 3 Killen, B. Lewis Survey, south offset to Strawn discovery in the Post Oak field, was drilling ahead around 3,000 ft. One mole southeast of the Post Oak field, Mid-Continent's 1 Campsey, M. W. Thompson Survey, was below 5,424 ft. in shale. Fur miles northeast of Jacksboro, J. J. Lynn 1 Willcocksin, M. Aiken Survey, was drilling below 4,944 ft.

Mid-Continent's 2 W. N. Killen, B. Lewis Survey, Ellenburger discovery in a Strawn area, was running tubing after bailing out. According to field reports, cable tools, run in the hole to drill cement from 6,275-90 ft., tarred out cement of a previously perforated section at 6,240-58 ft. and the well started flowing. In the first 30 minutes it waged 50 bbl. of oil and no water, through casing. During the next 12 hours it flowed by heads, yielding 240 bbl. of oil.

Among Jack County's new operations, was a report on Glasscock and Pontiac Refining Co.'s 2 Morris, which places its corrected location northwest of the discovery, 1,263 ft. from south and east lines of the J. U. Fields Survey. Scheduled depth is 8,000 ft.

Montague County.—In the Kenedy area 4 miles south of Montague, Continental Oil Co. 2 W. M. Fry, W. H. Chandler Survey, recovered 60 ft. of heavily oil-cut mud and no water on a drill-stem test of the Marble Falls at 6,539-6,609 ft. Gas come to the surface in 1 hour and 45 minutes.

Two miles northeast of Denver, Cu. U. Bay 3 Henderson Heirs, J. M. Hodges Survey, was drilling ahead below 3,800 ft. in shale, on a 6,400-ft. contract.

Baylor County.—Woods Drilling Co. and Cox Drilling Co. 1 W. H. Portwood, wildcat test 6 miles south of Bomarton, W. R. Dickerson Survey, Block 184, was drilling ahead in shale below 3,750 ft.

Callahan County.—Star Oil Co., Inc., 1 Mrs. C. Smith, 3 miles southeast of the town of Admiral, Section 45, D&DA Survey, had prospects of a new pay for the Admiral field. Completion from open hole in the Cross Plains sand from 1,920-38 ft. was being made after the section recovered 186 ft. of clean oil and 75 ft. of mud on drill-stem test. The Cross Plains sand lies between the Adams Branch and the Palo Pinto, in the Canyon series of the Pennsylvanian.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) SUCCESSFUL WILDCATS

Coleman County: H. E. White 2 W. H. Finley, Sec. 45, BBB&C Sur., 2½ mi. SE Novice, 1,320 ft. S 1 Finley, flowed 1,100,000 cu. ft. gas, Gardner sand 3,401-27 ft., TD 3,552 ft., had a small amount of free oil.

Young County: The Pure Oil Co. 1 J. K. Jeffery estate, Sec. 54, E&L Sur., 3 mi. NE Padgett (Mississippian) field, 3 mi. W Orth, flowed 194 bbl. of 44°-gravity oil a day, 14/64-in. choke, plus 40 per cent water, CP 575 psi., TD 275-350 psi., GOR 340, top Mississippin 4,817 ft., perforated 4,820-24 ft., 4,852-56 ft., and 4,832-35 ft., TD 5,275 ft., PB 4,897 ft., Ellenburger at 5,190 ft. had salt water.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 J. S. Bridwell "F," Sec. 1834, TE&L Sur., 10 mi. SW Windthorst, dry, TD 4,872 ft., Caddo 4,723 ft.

J. J. Lynn 1 Mrs. J. H. Robertson, John Lewellyn Sur., 8 mi. W Archer City, dry, TD 1,603 ft., Gunsight lime 1,403 ft.

J. W. Sorrells & Suntex Drilling Co. 1 Ted Coleman, Blk. 37, Brazos CSL, 2 mi. NE Scotland, dry, TD 5,681 ft., Caddo 5,402 ft., Barnett shale 5,660-81 ft.

Baylor County: Humble Oil & Refining Co. 1 R. J. Balch, Sec. 221, T&NO Sur., 7½ mi. SE Seymour, dry, TD 3,010 ft.

Callahan County: Murray Drilling Co. 1 Colonel Dyer, NE NE Sec. 38, BB&C Sur., 15 mi. E Abilene, dry, TD 2,103 ft.

Coleman County: R. H. LeBus 2 Lester West, Sec. 14, Brooks & Burleson Sur., 7½ mi. W Coleman, dry, TD 3,139 ft.

A. J. Slagter, Jr., 1 Cresswell estate, Sec. 96, Blk. 2, FH&H Sur., 6 mi. E Goldsboro, dry, TD 4,295 ft., Palo Pinto 2,703 ft., Caddo 3,615 ft., Ellenburger 4,160 ft., elev. 1,881 ft.

United North & South Development Co. 1 R. R. Browning, NE NE NW Sec. 6, T&NO Sur., 2 mi. N Glen Cove, dry, TD 3,531 ft., Capps lime 3,263 ft.

Comanche County: Bankline Oil Co. 1 Callaway, Sec. 60, D&DA Sur., 4½ mi. E Rising Star, dry, TD 3,425 ft., Caddo 2,350 ft., Ellenburger 3,282 ft., sulfur water 3,420 ft.

J. K. Hughes Oil Co. 1 E. O. Watkins, Sec. 40, D&DA Sur., 2 mi. N Sipe Springs, dry, TD 2,910 ft., Marble Falls 2,700 ft., elev. 1,257 ft.

H. W. Snowden 1 S. E. Glover, (formerly T. A. Kirk), BBB&C Sur., 8 mi. SE Gorman, dry, TD 2,996 ft., Caddo 2,617 ft.

Cooke County: Clark & Cowden Drilling Corp. 1 M. J. Kleiss estate, H. O. Kohlman Sur., 2 mi. W Muenster, dry, TD 2,600 ft.

Jack County: Cox Drilling Co. 1 Graham estate, J. Irwin Sur., 2 mi. S Jermyn, dry, TD 5,675 ft., Caddo 4,400 ft., Ellenburger 5,582 ft.

Jack Grace Production Co. 1 D. Lindsey, J. R. Maxwell Sur., 10 mi. N Jackson, dry, TD 6,186 ft., Caddo 4,947 ft., conglomerate 5,840-70 ft.

Jones County: W. J. Weaver, trustee 1 V. I. Miller, W. T. Evans Sur., 2½ mi. S Nugent, dry, TD 2,156 ft., Hope lime 1,885 ft.

Montague County: Russell Maguire 1 J. L. Norred, Sec. 29, ETRR Sur., 3 mi. S Montague, dry, TD 6,502 ft., conglomerate 6,328-50 ft., no shows, elev. 1,066 fft.

Russell Maguire 1 P. Vatili, S. A. Mills Sur., ½ mile SW Montague, dry, TD 6,421 ft., swabbed an estimated 37 bbl. oil a day from perforations 6,409-20 ft.

Nolan County: Bridwell and Mabee 1 C. W. Tipton, SE SW SW 43-19-T&P, 3 mi. SW

Trent, dry, TD 5,795 ft., Strawn sand 5,054 ft., no shows, Ellenburger 5,655 ft., had show of oil, elev. 1,983 ft.

Shackelford County: Deep Rock Oil Corp. 2 "B" Dawson, Sec. 184, ETRR Sur., 8 mi. NE Lueders, dry, TD 1,572 ft., water sand 1,403 ft., dry sand 1,492 ft., coal 1,535-40 ft.

Throckmorton County: R-G Drilling Co. 1 Davis-Larkin, Sec. 943, TE&L Sur., 4 mi. NW Woodson, dry, TD 4,774 ft., Caddo 4,026 ft., Mississippian 4,595 ft.

Wichita County: Fortex Oil Co. 1 Ed Wetstein, Blk. 254, Waggoner CSL, 6 mi. NE Electra, dry, TD 2,185 ft., sand with oil show, 2,010 ft.

Young County: Bobby Burns 1 Joe Campbell, Sec. 1389, TE&L Sur., 6 mi. NE Olney, dry, TD 5,200 ft., Caddo 4,617 ft., had gas shows.

F. E. Gilbreath 1 Mrs. R. D. Tyra, Young CSL, A-1285, 1½ mi. S Murray, dry, TD 3,640 ft., Caddo 3,620 ft.

Henry Grace Production Co. 1 J. H. Choate, Sec. 254, TE&L Sur., 7 mi. SE Olney, dry, TD 4,142 ft.

OKLAHOMA

Fishing Job Delays Tests In New Panhandle Pool

TESTING is under way in Bay Petroleum Co. 1 Frank Parkes, NE NE SW 34-4n-8ecm., prospective pool opener in Cimarron County, in the Panhandle. Casing, cemented at 4,843 ft., first was perforated with 15 holes at 4,814-19 ft. in the top of the Mississippi (top 4,815 ft.), where only a slight show of oil resulted. Additional perforations, 15 holes, then were made at 4,809-14 ft., taking in the lower part of the Keyes sand (basal Pennsylvanian), and a show of gas with a light spray of oil was obtained. Five more feet at 4,804-09 ft. then was perforated with 15 holes, and in a 13-hour test, the well flowed 74 bbl. of 42° oil through 1-in. choke with gas estimated at the rate of 3,150,000 cu. ft. per day. Since then 15 additional holes have been shot in the upper 5 ft., but the perforating gun was lost in the hole and further testing is temporarily delayed pending its recovery.

Top of the Keyes sand is at 4,775 ft., leaving an additional 29 ft. to be taken in and tested before final completion is attempted. It is proposed to perforate next up to 4,799 ft., taking in another 5 ft.

Kingery-Patterson and Stonewall Oil & Gas Co. 1 Weeden, SW SW SE 3-2s-6w, wildcat north of the old shallow Palacine production in Stephens County, flowed 401 bbl. of 32.3° oil in a 7½-hour production test from open hole at 4,776½-4,863 ft., and has been shut in for storage. Pressure during the test was 125 psi. on tubing and 225 psi. on casing. A trace of water was indicated. The pay zone is believed to be either Arbuckle detritral or Dornick Hills.

In Payne County, Eddie Fisher 1 Flohr, SE SW NW 5-18n-2e, 2 miles north of the Ramsey pool, swabbed at the rate of 4 bbl. of 39.4° oil per hour from Bartlesville sand with hole open from 4,384 ft. to total depth of 4,408 ft. Prior to the test a zone at 4,386-96 ft. was jet shot with 60 holes.

Ashland Oil & Refining Co. 1 Fore, NW NE NW 26-7n-7e, a mile southeast of the two-well Transco pool, Seminole County, flowed 30 bbl. of oil in the first 3 hours of a production test from the Calvin sand at a total depth of 1,756 ft. In the next 15 hours on ½-in. choke it flowed 23.42 bbl. Gas flow was estimated at the rate of 1,100,000 cu. ft. of gas daily. Top of the sand is 1,745 ft. with 7-in. casing at 1,746 ft.

W. A. Delaney, Jr., has what appears to be a good gas well in his 1 Long heirs, NE cor. 14-8n-9e, Hughes County. In a 30-minute drill-stem test of the Gilcrease sand at 3,133-45 ft., it showed for an estimated 4,600,000 cu. ft. of gas per day. The well

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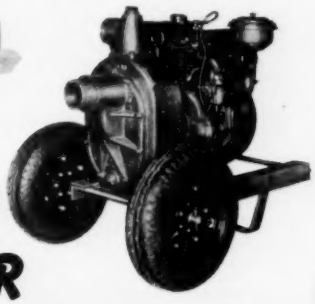

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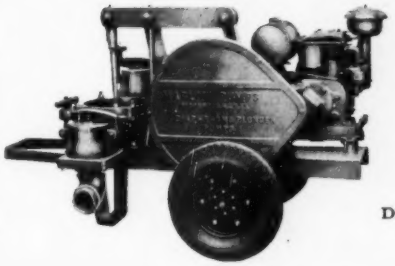

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OKLAHOMA SUCCESSFUL WILDCATS

Lincoln County: Creekmore-Romney 1 Nickell, NW NW SW 19-14n-6e, pumped 35 bbl. of 43°-gravity oil per day from Prue at 3,343-3,421 ft., TD.

Wood Oil 1 Haskins, SW SW SE 24-17n-5e, IP 2,500,000 cu. ft. of gas per day from Bartlesville at 3,365-80 ft., TD.

Oklahoma County: Jordan 1 Lewinsohn, SE SE SW 14-14n-1w, pumped 100 bbl. of 37.5°-gravity oil per day from second Wilcox at 5,960-68 ft., TD.

Payne County: Texas 1 Fisher, SW SE SE 25-19n-3e, pumped 90 bbl. of oil per day from Red Fork at 3,764-94 ft., TD.

Pottawatomie County: Davon 1 Santa Fe, NW NW SE 26-11n-4e, pumped 12 bbl. of 35.5°-gravity oil per day from unconformity at 4,790-4,819 ft., TD 5,578 ft.

Seminole County: King 1 Kelly, NW SW NE 12-10n-7e, pumped 45 bbl. of oil per day from Union Valley sand at 3,605-17 ft., TD 3,625 ft.

OKLAHOMA WILDCAT FAILURES

Caddo County: Jackson 1 Evanson, SE SE SE 35-6n-9w, dry, TD 2,370 ft.

Carter County: Craddock 1 Moore, SW SW NW 36-2s-1e, dry, TD 1,956 ft., Mississippian Caney 1,490 ft., Sycamore 1,813 ft.

Comanche County: Hollingsworth 1 Mitchell, NE SE SE 14-1n-13w, dry, TD 40 ft.

Cotton County: Wilcox Oil 1 Harrison, SW SW NE 24-3s-10w, dry, TD 2,011 ft., sand 774-80 ft. and 1,457-80 ft., granite wash 1,537-49 ft., conglomerate 1,970-85 ft.

Hutcheson 1 Adams, E/2 NE NE 32-3s-12w, dry, TD 1,825 ft., sand 1,390-95 ft., conglomerate 1,555-60 ft., sand 1,618-48 ft., lime 1,772-74 ft.

Creek County: Chapman 1 Mills, NW NE NE 14-14n-10e, dry, TD 3,168 ft., Woodford 3,033 ft., Sylvan 3,091 ft., Viola 3,120 ft., Wilcox 3,166 ft. with slight show of oil.

Harmon County: Dillard 1 Lewis, SE SE NW 28-4n-26w, dry, TD 5,095 ft., basal Pontotoc-top Canyon 4,410 ft.

Lincoln County: Biggs 1 Peechacek, NW NW NE 2-12n-6e, dry, TD 4,315 ft., Hogshooter 1,705 ft., Layton 1,820 ft., Checkerboard 2,060 ft., Prue 3,014 ft., Skinner 3,200 ft., Earlsboro 3,430 ft., lime 3,660 ft., Canyon 3,813 ft., Woodford 4,185 ft., Hunton 4,212 ft., Sylvan 4,296 ft.

Noble County: Amerada 1 Olmstead, SW SW NE 4-24n-1e, dry, TD 4,781 ft., Avant 2,985 ft., Osage-Layton 3,225 ft., Checkerboard 3,585 ft., Big lime 3,755 ft., Mississippi lime 4,316 ft., Woodford 4,638 ft., Viola 4,670 ft., Wilcox 4,707 ft.

Payne County: Aledo 1 Culp, SW SW SW 22-18n-6e, dry, TD 3,298 ft.

Pontotoc County: Bennett-Wisner 1 Surginer, NW NE NW 28-5n-7e, dry, TD 2,520 ft.

Seminole County: Kirkpatrick 1 Johnson, NW SW NW 2-6n-5e, dry, TD 3,165 ft., Belle City 1,024 ft., lower Calvin 2,510-56 ft., Senora lime 2,683 ft., upper Earlsboro 2,920-30 ft., lower Earlsboro 2,952-63 ft.

Helmerich & Payne 1 Davis, NE NE SE 5-8n-8e, dry, TD 4,232 ft.

Sinclair 1 Castor, NE NE NE 24-9n-7e, dry, TD 3,415 ft., lime 3,056 ft., Booch 3,170 ft., Gilcrease 3,284 ft., Union Valley lime 3,387 ft., Union Valley-Cromwell 3,395 ft.

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ILLINOIS

Wildcat in White County Finds Oil in Waltersburg

MATTOON—A new Waltersburg sand pool located about a mile west of production in New Haven, North pool and about the same distance east of Concord, Central pool in White County, appears to have been found by George & Wrather, Barclay Oil Co. et al in their 1 H. S. and W. C. Garrison, 3-7s-10e. In a 60-minute drill-stem test of the sand at 2,154-64 ft. (elevation 365 ft.), approximately 1,730 ft. of oil and 70 ft. of oil-cut mud were recovered with a good show of gas. Casing has been cemented on top the sand.

Freeman Lomelino 1 Xavier Ochs, C NW NE 27-6n-10e, 6 miles southeast of Newton, Ill., and about a mile east of production in Clay City-Noble Consolidated area, encountered good showings of oil both in the Carper sand at 4,116-52 ft. and in the Devonian lime at 4,344-64 ft. and 4,396-4,404 ft. and has run 7-in. casing to 4,422 ft. (total depth), preparatory to testing. Several miles from the nearest Devonian production, it promises to open a new, deep pay for the area. Elevation is 515 ft.

In Franklin County, Paul Moseback 1 Bays, SE NE SW 35-5s-1e, a wildcat about 2 miles south of Sesser pool, also is showing for possible production in the Devonian, topped at 4,352 ft. (elevation 460 ft.). In a drill-stem test at 4,392-4,445 ft., 55 ft. of oil-cut mud was recovered with the tool open 2 hours. Previously, 25 ft. of oil-cut mud was recovered in a 1½-hour drill-stem test at 4,425-55 ft. No water was evident. The well also had showings in the Aux Vases sand at 2,600-30 ft., and in the McClosky lime at 2,774-83 ft. Casing has been cemented on top the Devonian, which will be tested through open hole. The McClosky will be tested through perforations, while the Aux Vases will be tested by milling out an alloy section in the casing opposite that zone.

Schafer-Granholm-Dayton 1 Cusick, NW NE SW 20-11n-10w, Clark County, swabbed 1½ bbl. of oil and 5 bbl. of water per hour in a test of the Devonian at 2,088-95 ft. (elevation 545 ft.). It is west of the new Devonian development that has been going on across the state line in Sullivan and Vigo counties, Indiana. The well was drilled to a total depth of 2,135 ft. and plugged

back to 2,094 ft. Pumping equipment is being installed.

Marion County has a new McClosky lime pool in Winn & Beck 1 Cheeley, NE NE SW 3-2n-4e. With casing perforated with 12 holes at 2,738-48 ft. (elevation 500 ft.), the well swabbed 2 bbl. of oil per hour, and is being put on the pump. Total depth is 2,807 ft. Location is about 3 miles north of Iuka pool and about 5 miles west of Xenia pool.

ILLINOIS WILDCAT FAILURES

Christian County: Tully & Carter 1 E. Reulecke, SE SW NW 35-11n-1w, dry, TD 1,627 ft.

Clay County: A. J. Slagter 1 Dillinger, SE SW NE 8-4n-6e, dry, TD 2,861 ft.

Edwards County: J. W. Rudy 1 Roby, NE NW NE 11-1n-10e, dry, TD 3,265 ft.

Marion County: H. Luttrell 1 Curley, SW NW SE 17-4n-3e, dry, TD 1,701 ft.

Richland County: W. F. Lacy 1 V. Heckler, NE NW NW 22-3n-14w, dry, TD 3,268 ft.

St. Clair County: J. L. Neary 1 C. Gnadt, C N½ NW SE 33-1s-8w, dry, TD 1,505 ft.

Washington County: W. L. Griffith 1 County farm, NW SE SW 29-2s-2w, dry, TD 1,515 ft.

White County: George & Wrather 1 H. L. Mac Queen, NE NW SW 5-6s-10e, dry, TD 3,196 ft.

PERMIAN BASIN

Magnolia Petroleum Co. Extends Dollar Hide Pool

MIDLAND.—Magnolia Petroleum Co. 18-B Cowden, southeast extension test to the Dollar Hide multiple-pay field of Andrews County, in NE NE 12-A-55-PSL, was a promising discovery when it recovered clean oil on a drill-stem test in cherty lime, tentatively identified as either the basal Devonian or upper Silurian.

A 3-hour test from 10,995-11,035 ft., open 3 hours, brought gas to the surface in 1 hour and 35 minutes and recovered 3,270 ft. of 39°-gravity oil, 450 ft. of oil and gas-cut mud, and the 2,250-ft. water cushion. The test was made through ⅝-in. bottom and 1-in. too chokes. Operators drilled ahead to 11,085 ft. and were running a test on last report.

One mile north of the Dollar Hide field, Cities Service Oil Co. 1-E Cowden, SE SW 14-A52-PSL, had additional pay in the Fusselman section of the Silurian. The well yielded 1,170 ft. of heavily oil-cut mud, estimated to be 14 bbl. of mud and 4 bbl. of oil, on a test from 7,675-8,710 ft. At 8,661-8,736 ft., drill pipe was pulled when the packer slipped at the end of 59 minutes. Gas was in the pipe 4,300 ft. from bottom and recovery was 330 ft. of very heavily oil-cut mud, and 60 ft. of mud.

Last test of the section was from 8,629-8,756 ft., with the tool open 4 hours and 20 minutes. Recovery was 240 ft. of clean oil, and 520 ft. of half mud and half oil, with no water. Operators drilled ahead to 8,792 ft. and set 7-in. pipe on bottom. Top of the Silurian has been placed at 8,655 ft., on an elevation of 3,225 ft.

Gaines County.—Ralph Lowe 1 Helen Cunningham, 4-A24-PSL, established a ½-mile west extension to the Doss (Clear Fork) field and gave the area a new pay in the Canyon limestone. The well missed the field's regular pay, from 6,980-7,200 ft. It is on a 10,000-ft. contract and was to drill ahead.

First pay in the Canyon came on a 1-hour and 35-minute drill-stem test from 8,800-8,971 ft. Gas come to the top in 45 minutes, mud in 70 and oil in 80 minutes. It flowed at the rate of approximately 17 bbl. hourly, for 15 minutes. It was drilled to 8,980 ft. with packer at 8,900 ft., open 5 hours; gas came to the surface in 33 minutes, mud in 92 and oil in 102 minutes. It gaged 57 bbl. of 47°-gravity oil during the last 3 hours of the test. Drill pipe unloaded oil while being pulled and the estimated recovery was 7,600 ft. of oil, plus 30 ft. of salty sulfur water.

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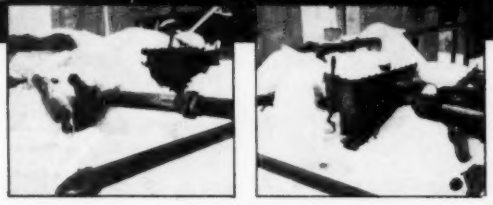

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See Our Catalog In SWEETS

Viking PUMP COMPANY Cedar Falls, Iowa

for a Clear Fork test ½ mile south of its 1 Hawkins, Ellenburger (12,180 ft.) discovery of the Flanagan field. The new 7,300-ft. exploration is to be the 2 W. L. Hawkins, SE SE 8-A-23, PSL. The discovery well flowed oil on two drill-stem tests in the Clear Fork. One mile south and ½ mile east, George P. Livermore, Inc., 1 Joe Head, Section 12, indicated commercial production in the Clear Fork. It was drilling ahead below 9,669 ft.

In southeast Gaines, Forest Oil Corp. and Anderson-Prichard Oil Corp. have staked location for an 8,000-ft. wildcat approximately ½ mile north of the Andrews County line. The test is to be the 1-A Parmer, 860 ft. from west and 660 ft. from south lines, Labor 12, League 317, Parmer County School Land. It is southeast of The Texas Co. 1 Parmer, a 5,417-ft. San Andres failure, drilled in 1945.

Scurry County.— Barnsdall Oil Co. this week announced seven new locations offsetting Sunray Oil Co.'s 1 R. B. Brown, recent Canyon limestone discovery 3 miles south of the North Synder field. Barnsdall's first location was for 1 A. L. Wren, 660 ft. from north and east lines, Tract 9, Section 20, Block 1, J. P. Smith Survey, west offset to the discovery. The seven new drill sites are also in Section 20. According to field reports, operations are to start June 2 drilling one well at a time. All are projected to 6,700 ft. with rotary.

Lone Star Producing Co. 1 M. M. Maule, SE SE 451-97-H&TC, northwest extension try to the North Snyder field, has been abandoned at 8,297 ft. in the Ellenburger.

Humble Oil & Refining Co. 1 Luther Edmondson, west of the 1 Maule, in NE NE NE 437-97-H&TC, was drilling in the Ellenburger below 8,335 ft. On last report it had water on a drill-stem test from 8,285-8,305 ft.

J. L. Collins et al 1 G. E. Parks, 442-97-H&TC, 1½ miles east of the North Snyder field, recovered 6 ft. of mud with no shows on a drill-stem test at 7,071-96 ft.

Pecos County.— Construction of El Paso Natural Gas Co.'s pipe line outlet to the Santa Rosa Ellenburger gas-distillate field has given the area a third operation, to be drilled, and a chance for further development.

C. W. Chancellor, Slick Oil Co. and others, who opened the field in 1948, made location for their 2 Thornton Davis, SE SE 105-8-H&GN, ½ mile southeast of the discovery. Contract depth is 9,700 ft. The well is ¼ mile west of the Slick-Urschel and Shell 1 Peerless, the field's confirmation well in Section 108, which completed for 28,000,000 cu. ft. of gas daily and 27 bbl. of distillate per 1,000,000 cu. ft. of gas, from perforations at 9,000-9,250 ft. It was finished several months ago and shut in.

El Paso Natural has a gas-processing plant under construction near Monahans, to handle gas from the above field. It was expected to be in operation by September of this year. Meanwhile, the Santa Rosa line will tie in with the El Paso firm's system which supplies gas to the West Coast area.

Borden County.—The Vealmoor Pennsylvanian field of Howard County has been extended over the Borden county line at Seaboard Oil Co. of Delaware 4 H. N. Zant, 1,970 ft. from west and 1,987 ft. from north lines of a lease in 28-32-T3N-TP Survey. The well made a daily potential of 444.6 bbl. of 45.9°-gravity oil, flowing through 14/64-in. choke from open hole at 7,770-7,840 ft. Gas-oil ratio was 598 cu. ft. There was no water, and the section was not acidized. Location is approximately 1 mile northeast of nearest production, and about 2 miles east of Seaboard's 1 Caldwell, dry at 8,340 ft.

WEST TEXAS (DISTRICTS 7-C & 8)
SUCCESSFUL WILDCATS

Runnels County: George W. Strake 1 B. A. Jacob, NE NE 20-acre lease, Sec. 83, J. Hensley Sur., 4 mi. NW Winters, flowed 72 bbl. of 41°-gravity oil in 4 hr., ½-in. choke, TP 90 psi., Gunsight sand 2,811-25 ft., TD, North Winters field discovery.

Scurry County: Humble Oil & Refining Co. 1 Richard Bishop, SW SW 164-97-H&TC, N of Sharon Ridge San Andres production, flowed 349 bbl. of 44.7°-gravity oil a day, ⅝-in. choke, Canyon lime 6,665-80 ft., TD, GOR 850, elev. 2,304 ft., Sharon Ridge Canyon field discovery.

WEST TEXAS (DISTRICTS 7-C & 8)
WILDCAT FAILURES

Gaines County: Argo Oil Corp. 1-B E. H. Jones, 31-AX-PSL, 1 mi. W and ½ mi. S Argo 1-N Jones, 1948 Devonian discovery, dry, TD 11,380 ft., Devonian 11,-353 ft., elev. 3,618 ft.

Runnels County: Slick Oil Co. 1 G. A. Gulley, Sec. 118, C. Hobbs Sur., ¼ mi. E Bruce All fair, 4 mi. S Ballinger, dry, TD 4,917 ft., Ellenburger 4,298 ft., Wilburn sand 4,774 ft., elev. 1,725 ft.

Scurry County: Fullerton Oil Co. 1-A W. A. Reiter, SW SW 115-97-H&TC, 2 mi. SW Ira, dry, TD 8,092 ft., Reef lime 7,248 ft., elev. 2,288 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1 Betenbaugh, Pennsylvanian limestone discovery 5 miles northwest of Crossroads Devonian field of northeastern Lea County, retested this week from 9,602-52 ft. In 4 hours it flowed 139 bbl. of 46.9°-gravity oil, with gas-oil ratio of 1,818 cu. ft. On the first test at that interval it flowed 35 bbl. of oil an hour. Operators cemented 7-in. casing at 9,641 ft. Chokes on the above tests were 1-in. bottom and ⅝-in. top. Flowing pressures ran from 1,250-1,500 psi., and shut-in. pressure in 15 minutes was 3,550 psi. Porosity was logged from 9,623-38 ft., with no porosity or stains from 9,638-52 ft.

Stanolind Oil & Gas Co. 1 South Mattix Unit, Ellenburger discovery on the east side of shallow Langlie-Mattix field, flowed 43 bbl. of oil to tanks on a 3-hour drill-stem test from additional pay. The well, at last report, had a total of 184 ft. of indicated pay section, of which 134 ft. has produced flowing oil on drill-stem tests.

On a 17-hour test from open hole at 9,486-9,570 ft., the well flowed 217 bbl. of oil. On a 5-hour test at 9,570-9,620 ft., gas

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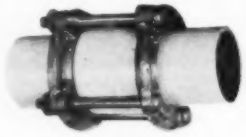

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came to the surface in 14 minutes, estimated at 100,000 cu. ft. daily, and recovery was 2,400 ft. of heavily oil-cut mud. On its last drill-stem test, from 9,620-70 ft., gas showed in 10 minutes and flowing oil in 55 minutes. It cleaned into pits for 40 minutes, then tanked 20 bbl. of oil the first hour, 17 bbl. the second hour, and 16 bbl. the third hour. Following that, it drilled ahead below 9,699 ft. Location is 10 miles south of the Brunson Ellenburger field in NW SE 15-24s-37e.

Amerada Petroleum Corp. 1-CA State, 9-10s-36e, was drilling below 11,712 ft. in Pennsylvanian limes and shales. Amerada 1-BTA State, 2-12s-33e, was drilling ahead below 11,191 ft. in dolomite, believed to be the Ellenburger. The same firm's 1 Caudle, northeast of the Caprock field, in 10-12s-33e, was drilling a 7,007 ft. in lime, and its 1-BTB State, 26-12s-33e, 4 miles south of the 1-BTA, was drilling ahead at 6,022 ft.

Magnolia Petroleum Co. 1 Cox-Federal, 1-9s-36e, 4 miles northeast of Crossroads field, had total depth at 12,847 ft. in dolomite and lime, and was trying to regain circulation. Operators' top on the Devonian at 12,539 ft., or minus 8,481 ft., was 400 ft. low to the Crossroads discovery.

Phillips Petroleum Co. 1 Shipp, west of the Hobbs field in 20-18s-37e, recovered water blanket and a small amount of mud, with no shows, on a drill-stem test from 12,584-12,626 ft., total depth. Electrical surveys were run and the hole plugged back to 6,079 ft. Top of the pre-Cambrian was placed at 12,594 ft., on elevation of 3,747 ft.

One-fourth mile from nearest production in Warren field, (McKee sand), Continental Oil Co. 1-A-29, pre-Cambrian test in SE NW 29-20s-38e, reported the first oil from the Devonian section for that part of the country. On elevation of 3,538 ft. it topped the Devonian at 7,750 ft. A 1½-hour drill-stem test from 7,736-7,821 ft. recovered 4,175 ft. of oil, plus 2,700 ft. of oil and gas-cut mud, and 630 ft. of sulfur water. The oil tested 37° gravity.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCAT

Lea County: G. H. Vaughn 1-16 Phillips-State, SW SW 16-17s-33e, 1¼ mi. N Maljamar field, flowed 43 bbl. of 36°-gravity oil a day, Gravburg sand 4,340-4,430 ft., TD 4,574 ft., PB 4,564 ft., 16/64-in. choke, TP 100 psi.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Eddy County: George D. Riggs 1 Jerris, 5-21s-24e, dry, TD 1,284 ft., Grayburg 431 ft., San Andres 875 ft., elev. 3,780 ft., water 1,279-84 ft.

Martin Yates, Jr., 3 State, NE NE 36-19s-29e, dry, TD 1,729 ft., base salt 1,230 ft., top Yates 1,415 ft., elev. 3,324 ft.

MISSISSIPPI

Development Wells Pace Activities for Week

JACKSON.—The California Co. 8 Brookhaven Unit, Tract 70, 31-8n-7e, in Brookhaven field, Lincoln County, has been completed with an initial production of 173 bbl. of 33°-gravity oil, on the pump. Total depth is 10,471 ft. with perforations from 10,442-62 ft. for completion.

In LaGrange field, Adams County, Humble Oil & Refining Co. 2 Mrs. B. B. Moore et al, 66-7n-2w, was completed flowing 120 bbl. of 42.4°-gravity oil per day through a ⅛-in. choke, tubing pressure 375 psi., gas-oil ratio 196. Total depth is 6,127 ft. Production is from the Baker sand with perforations from 6,098-6,101 ft.

In the South LaGrange field, Adams County, T. F. Hodge 1 E. B. Ogden, 41-6n-2w, was drilled to a total depth of 6,472 ft., and completed through perforations at 4,563-65 ft., flowing 25 bbl. of oil plus gas and water through a 18/64-in. choke. Tubing pressure was 580 psi.

Humble completed its 16-B G. M. & O.

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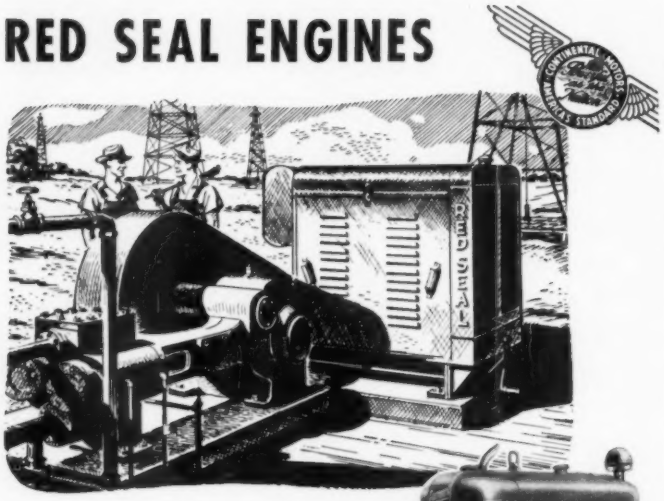

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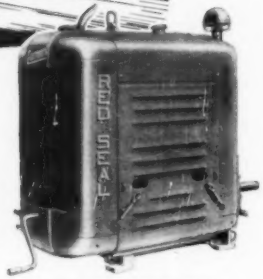

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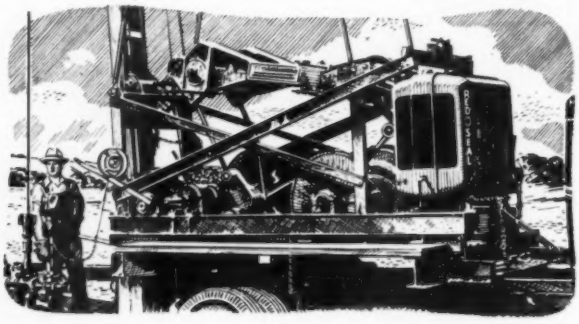

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Land Co., 14-9n-8w, in Yellow Creek field, Wayne County, pumping 31 bbl. of oil per day. Total depth is 5,130 ft., with production from perforations at 5,050-58 ft., 5,086-92 ft., and 5,123-30 ft. Tops were: chalk 3,898 ft., Morgan 5,050 ft., City Bank 5,086 ft., second City Bank 5,123 ft.

ALABAMA WILDCAT FAILURE

Pike County: Dewey F. Foster & Warren N. Dunningan 1 J. L. & H. W. Folmar, 14-9n-19e, dry, TD 3,508 ft.

KANSAS

Production Tests Prove Forest City Basin Pool

INITIAL production tests in Carter Oil Co. 1 Davis, SW SE SW 33-13-10e, rank wildcat in the south end of the Forest City basin, in Wabaunsee County, have established it as the discovery well of a new Viola lime pool, verifying indications of this given in previously reported drill-stem tests.

With 7-in. casing plug at 3,201 ft., drilled out and hole cleaned to total depth of 3,201 ft., the well swabbed at the rate of 52½ bbl. of 29° oil per hour in the first 6 hours from a depth of 1,600 ft. off bottom. In the next 6 hours it flowed an average of 26.38 bbl. per hour. Further tests are under way.

Bay Petroleum Corp. has opened another new pool in southeastern Barton County 'n its 1 Krone, SW SW SW 30-20-12. At a total depth of 3,531 ft. in Arbuckle, topped at 3,490 ft. (—1,617 ft.), the well swabbed 3½ bbl. an hour for an initial test. Location is a mile northeast of the Rolling Green pool and 2½ miles south of the recently opened Sunny Valley pool.

In the southeastern part of Graham County, M. B. Arner 1 Teall, NW NW SE 9-10-21, swabbed at the rate of 2 bbl. per hour after plugging back from the Arbuckle and perforating casing in the Lansing. Lansing was topped at 3,483 ft. (—1,254 ft.) and the zone perforated at 3,523-33 ft. Top of the Arbuckle was 3,817 ft. and hole was drilled to 3,822 ft. without shows. The well is 3 miles northwest of the recently opened Morlan pool and 3½ miles south of the Morel pool.

Nadel & Gussman and Aurora Gasoline Co. 1 Ouderkirk, SE SE NW 7-10-19, a mile north of the North Berland pool, Rooks County, is proving an exceptionally good well. Drilled to a total depth of 3,762 ft. in the Arbuckle, topped at 3,757 ft. (—1,536 ft.), and with casing at 3,758 ft., it was treated with 600 gal. of acid and swabbed 80 bbl. of oil per hour at 2,000 ft. off bottom.

KANSAS SUCCESSFUL WILDCAT

Rooks County: Continental Oil Co. 1 Yohe, SE SE NE 4-9s-18w, pumped 892 bbl. of 37°-gravity oil per day from Lansing at 3,266-90 ft.; anhydrite 1,370 ft., conglomerate 3,442 ft., Arbuckle 3,474 ft., TD 3,511 ft.

KANSAS WILDCAT FAILURES

Butler County: Talbott-Penguin and Sohio 1 Kemper, SE NW NE 5-28s-4e, dry, TD 2,892 ft., Topeka 1,500 ft., Lansing 1,750 ft., Kansas City 2,140 ft., Mississippian 2,614 ft., Simpson 2,850 ft., Arbuckle 2,876 ft.

Ellis County: Darby & Bothwell 1 Wasinger, NW NW SW 35-12s-18w, dry, TD 3,718 ft., anhydrite 1,195 ft., Topeka 3,106 ft., Heebner 3,341 ft., Lansing 3,390 ft., conglomerate 3,637 ft., Arbuckle 3,667 ft.

Graham County: Pack, Braden & Green 1 Smith, NW NW NW 20-7s-22w, dry, TD 3,973 ft., anhydrite 1,910 ft., Heebner

3,504 ft., Lansing 3,546 ft., Marmaton 3,782 ft., conglomerate 3,866 ft., Arbuckle 3,913 ft.

Westgate-Greenland Oil Co. 1 Scott, NE NE SE 21-8s-22w, dry, TD 3,853 ft., Heebner 3,399 ft., Kansas City 3,439 ft., Arbuckle 3,819 ft.

Ottawa County: Westgate-Greenland Oil Co. 1 Foote, NW NW NE 29-9s-1w, dry (core drill), TD 3,613 ft., Mississippi lime 2,662 ft., Hunton 2,982 ft., Viola 3,332 ft., Simpson 3,466 ft., Simpson sand 3,502 ft., Arbuckle 3,570 ft.

Rice County: Beardmore Drilling Co. et al 1 Womer et al, NW NE NW 14-19s-6w, dry, TD 3,380 ft., Lansing 2,800 ft., Mississippian 3,345 ft., Kinderhook 3,373 ft.

Stafford County: Peel & Hardman 1 Brensing, SE SE NW 19-22s-12w, dry, TD 3,775 ft., Lansing 3,366 ft., Viola 3,645 ft., Simpson 3,695 ft., Arbuckle 3,755 ft.

LA.-ARK.

Carter Oil Drills Ahead At Lisbon Area Test

SHREVEPORT.—In Union County, Arkansas, Carter Oil Co. 1 T. F. Russell, SW NW 33-17s-16w, was drilling ahead in the Travis Peak below 5,223 ft. Early in the week the well topped the Nacatoch sand at 2,070 ft., on elevation of 240 ft., and recovered sand with slight odor and oil taste at 2,141-52 ft. A drill-stem test of that interval recovered 30 ft. of slightly gas-cut mud in 30 minutes. Location is 1 mile south of the Lisbon field.

Bossier Parish, Louisiana.—Barnsdall Oil Co. 1 Ardis, 27-22n-11w, cored lime with a slight amount of porous sand having distillate odor. It cored ahead at 9,739 ft. in the Cotton Valley.

Caddo Parish.—Fields & Pickens 1 Sentell, 23-19n-14w, were coring in lime with streaks of shale below 8,287 ft.

Phillips Petroleum Co. 1 Ellerbe, 17-15n-12w, ran 5½-in. casing to 9,011 ft., perforated at 8,890-8,910 ft. and drill-stem tested. Using ¼-in. chokes and 1,000 ft. of water cushion, tubing pressure rose to 640 psi., then dropped to 45 psi. in 30 minutes. It flowed a small amount of water cushion and was still open at last report.

Claiborne Parish.—Hunt Oil Co. 1 Owens, 19-23n-6w, was drilling Travis Peak at 8,296 ft. C. R. Schuster 1 Dance, 20-19n-6w, was in the lower Glen Rose at 6,509 ft.

Ouachita Parish.—The California Co. 1 Brown Paper Mill, 10-16n-3e, was coring the Cotton Valley below 10,398 ft., recovering lime and hard sand with salty taste.

Sabine Parish.—Union Oil Co. of California 1 Long Bell, 35-7n-13w, had total depth at 6,011 ft. in the Glen Rose. Cores at 5,744-57 ft. and 5,868-73 ft. recovered fine-grained, oolitic lime with oil show, and a drill-stem test from 5,737-57 ft., open 15 minutes, recovered 90 ft. of oil-cut mud, 450 ft. of oil-cut mud and salt water, plus 90 ft. of salt water. Bottom-hole flowing pressure was 265 psi.

NORTH LOUISIANA WILDCAT FAILURES

Bossier Parish: Clark Sample 1 McCloud, 13-19n-11w, dry, TD 5,010 ft., Nacatoch 700 ft., Blossom 1,445 ft., Tokio 1,470 ft., lower Cretaceous 1,985 ft., base Rodessa 2,090 ft., Pettit 2,385 ft., Cotton Valley 4,475 ft., sand 4,810-60 ft., Bodcaw 4,900 ft., elev. 226 ft.

Caddo Parish: Morris and Kendrick 1 Dominick, 3-22n-16w, dry, TD 3,501 ft.

Grant Parish: E. F. Neely 1 Urania Lumber Co., SW NW 5-7n-1e, dry, TD 4,511 ft.

ARKANSAS WILDCAT FAILURE

Nevada County: C. L. Wickliffe 1 Jim Dale, 3-10s-23w, dry, TD 883 ft., had water and show of nitrogen.

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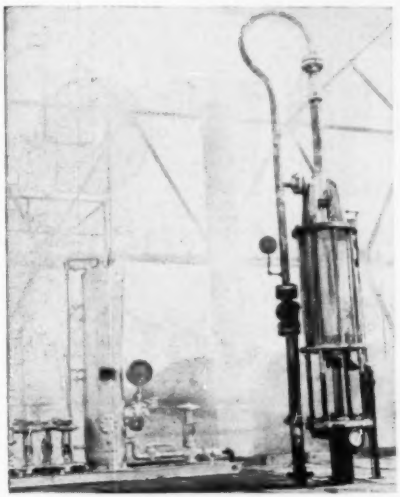

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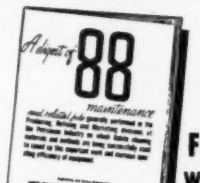

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OHIO, KENTUCKY

Buzzard's Glory Field Gets Southwest Extension

COLUMBUS.—West of Buzzard's Glory in Hopewell Township, Licking County, Craig Adair et al extended the pool nearly ½ mile to the southwest with a 70-bbl. well on 1 William Bratton, Lot 24. Clinton was found at 2,929-60 ft. where the hole filled with 1,100 ft. of oil while drilling in. After shot, the well flowed 45 bbl. and swabbed 25 bbl. in 24 hours.

In Perry County, the Mid East 3 J. R. Underwood, Section 34, Hopewell Township, drilled the Clinton at 2,955-91 ft. with an oil showing that made 40 bbl. in 24 hours after shot. In Bearfield Township, the Ohio Fuel 1 C. L. Rose, Section 10, made 188,000 cu. ft. of gas in the Clinton at 3,743-68 ft., and 118,000 cu. ft. in the Medina at 3,841-51 ft. The Medina was shot and the total shut-in gas gaged 500,000 cu. ft.

Ringler & Fierbaugh will drill two wildcats to the Clinton in Greenwich Township, Huron County. The first location will be on English property, east of the town of Greenwich.

Drilling in Athens County has recently become more active; this week four new locations were reported. Ashland County followed with three new spots and Noble and Perry counties two each.

EASTERN KENTUCKY

ASHLAND—In Menifee County, 20-Q-72, Roy Davis et al 1 Collingsworth after finding Corniferous lime from 1,220-1,325 ft. dry, drilled deeper to a total depth of 1,900 ft. and tested the Brassfield lime which was also found to be barren. Operators are now shut down pending decision to deepen to lower possible producing sands.

In Fleming County, 14-V-71, a 1-week pumping test at Ed Lillie et al 2 John Riley produced only water at the rate of approximately 6 bbl. per hour. Operation is again shut down for orders.

In Lee County, 19-N-69, the closely watched Knox wildcat test of Jack Kindred 1 C. J. Sipple ran into more water trouble. After setting 5½-in. casing at 3,357 ft. to shut off upper Knox water zones, operators drilled ahead some 20 ft. and experienced more water. Crews then pulled pipe and are drilling ahead looking for a more suitable casing point.

EASTERN KENTUCKY WILDCAT FAILURE

Breathitt County: United Carbon Co. 17-1538 E. J. Evans fee, Quicksand Creek, dry, TD 2,781 ft., Maxon 1,155 ft., Big lime 1,273 ft., Corniferous 2,355 ft., Big Six sand 2,711 ft., ¾ bbl. oil per day after shot from Big Six.

WESTERN KENTUCKY

OWENSBORO—The Glenville area of Daviess County, about 10 miles south of Owensboro, now has a McClosky producer that may revive some interest in the area. Sohio Petroleum Co. 1 Sourbeer, NW NW SE 19-N-2E, was completed in the McClosky at 2,010-14 ft. pumping 214 bbl. per day. The well was treated with 2,000 gal. of acid.

In a northeast extension to the Pellville area of Daviess County, F. M. Ashby has completed 1 W. E. Aud, NW NE NW 25-P-3E, with an initial production of 100 bbl. per day from the McClosky at 1,004-11 ft. Ashby has two more tests in the same section. Great Lakes Carbon Co. 2-M Street, SW SW NW 21-P-3E, is testing the McClosky at 958-69 ft. and showing for a producer.

On the eastern edge of Uniontown pool, Kingwood Oil Co. 1 Ryan et al, 16-P-2E, has been completed for 126 bbl. per day on pump from the Cypress at 2,287-95 ft.

Guffie pool in McLean County has another good Jackson sand well with the

completion of Miller & Shiarella 2 Smith heirs, NE NE SE 20-N-27. The well made 125 bbl. per day from pay at 1,859-70 ft. Total depth is 1,941 ft.

INDIANA

EVANSVILLE.—Interest continues in the Devonian development in the area between Marts and Shelburn pools in Sullivan County as F. B. Cline completes two wells and A. S. Reed one well in this pay. Cline 1 H. Sluder, SW NE NW 20-9n-9w, was completed in the Devonian at 2,074-78 ft., at 2,097-2,111 ft., and at 2,134-40 ft. with an initial flowing production of 600 bbl. per day through ¼-in. choke. Cline 2 H. Sluder, NW NE NW of the some section flowed 240 bbl. per day. Reed 2 D. Sluder, SE NW NW Section 20, flowed 720 bbl. per day. All of the wells were treated with acid.

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Carter Oil Co. has several wells nearing the completion stage in the development of the East Mount Carmel area that is just north of White River. The wells are in Section 13 of 1s-12w and most of the wells are testing the Benoist or Hardinsburg or both. S. D. Jarvis 7 Stillwell and Holsen in the same section is squeezing for further Benoist tests after bailing 75 bbl. of oil and 400 bbl. of water in 12 hours.

The prospective McClosky pool opener for Posey County, B. M. Heath 1 S. L. Highman, SE SE SW 18-8s-13w, is preparing for completion tests of the McClosky at 2,630-2,716 ft. The well flowed at the rate of 12 bbl. of oil per hour on drill-stem test of zone at 2,630-50 ft. Total depth is 2,751 ft.

About 2 miles northwest of the Highman well, Carter Oil Co. is preparing to drill plug at 1 Hanshoe, SE SW NE 11-8s-14w, in Spencer pool which was opened last November.

The good McClosky well in the southern part of North Owensville pool in Gibson County has been completed. The well, Ashland Oil & Refining Co. et al 1 P. Brazelton, SE SW SW 30-2s-11w, flowed 350 bbl. per day through ⅜-in. choke from pay at 2,299-2,305 ft. The same operators shot the Cypress and swabbed at the rate of 7 bbl. of oil per hour at 2 P. Brazelton which is one location west of the McClosky well.

INDIANA SUCCESSFUL WILDCAT

Posey County: Coy Oil Co. 1 Joseph Grumble, SE SE SW 36-6s-12w, IP 15 bbl., Jackson sand, 2,170-78 ft., TD 2,191 ft. (New pay in Heusler pool.)

INDIANA WILDCAT FAILURES

Gibson County: Ryan & Sharp 1 Miller, NW NE SE 16-2s-12w, dry, TD 2,533 ft.
Cherry & Kidd 1 Kitts, NW SE SW 17-3s-13w, dry, TD 2,854 ft.
Jefferson County: Harley R. Burton 1 Cheatam, C S½ SE SW 32-4n-8e, dry, TD 1,580 ft.
Spencer County: Sun Oil Co. 1 Kramer, SW NW SW 19-8s-6w, dry, TD 1,750 ft.
Vigo County: James Graham 1 Ray E. Watson, SE SW SW 29-10n-10w, dry, TD 2,300 ft.

APPALACHIAN FIELD

Hope Natural Gas Co. Tests Oriskany Gas

PITTSBURGH.—In Portland district, Preston County, West Virginia, Hope Natural Gas Co. 9315 P. S. Pyles, elevation 2,197 ft., reported further shows of gas in the Oriskany sand which was topped at 5,857 ft. The additional gas was encountered at 6,002-03 ft. and 6,023-27 ft. The total test of gas was 166,000 cu. ft. In Grant district, Ritchie County, this company's 9300 Jessie Powell, elevation 1,006 ft., is drilling in the Oriskany sand at 5,755 ft., and Davis-Kelly Oil Co. 1 Morello Jackson, elevation 633 ft., is drilling at 2,257 ft. Two good shallow sand gas wells in the Berea sand were reported in Baileysville district, Wyoming County: Godfrey L. Cabot, Inc., 8-1294 Ford Motor Co. gaged 1,400,000 cu. ft., total depth 3,928 ft.; United Producing Co. 81-1616 W. M. Ritter Lumber Co., 1,050,000 cu. ft., total depth 3,405 ft.

In Unity Township, Westmoreland County, Pennsylvania, Peoples Natural Gas Co. 3830 William Piper, wildcat, elevation 2,061 ft., recorded the Onondaga lime at 8,130 ft. and is drilling at 8,135 ft. In Derry Township, its 4-3814 Camilla Giffin, elevation 2,238 ft., has reached a depth of 8,564 ft.

There were nine new locations in West Virginia: two in Gilmer County, one each in Jackson, Lewis, Lincoln, Logan, Raleigh, Tyler, and Wayne counties. Six new drill sites in southwestern Pennsylvania were spotted as follows: two in Armstrong and Clarion counties, one each in Fayette and Jefferson counties.

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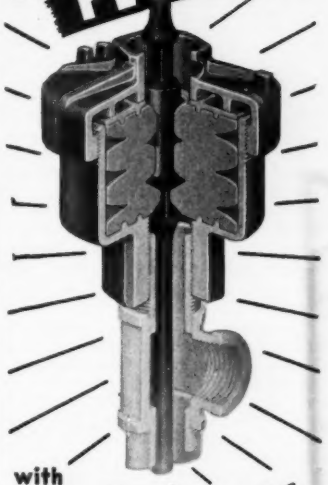

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Humble Has Increased Its Crude-Oil Production 150 Per Cent Since 1941

SINCE 1941 Humble Oil & Refining Co. has increased its production of crude oil and other petroleum liquids by 150 per cent, and 1948's production was up 8 per cent over 1947, totaling 140,800,000 bbl., an all-time high, according to the company's annual report.

The company also reported record earnings, but at the same time disclosed that capital expenditures amounted to 28 per cent of the net book investment remaining in fixed assets at the end of 1947. Total expenditures for operation, replacement of equipment, and modernization and expansion of its facilities was $138,302,000.

The company expanded its exploratory work, and, despite record production, proven reserves remained constant, due to extensive search for new oil. In 1948 the number of exploration crews in operation, the number of exploratory wells completed, and total cost of leases acquired by Humble reached record levels. The report states that "although the net production of 140,800,000 bbl. of all petroleum liquids was the largest in the company's history, proven oil reserves were maintained as a result of revised estimates for older fields, and the discoveries and extensions achieved by intensive and comparatively costly exploratory effort."

Humble completed more wells in 1948 than in any other year since 1938 (768). Approximately one-third of the company's drilling activity was in Southwest Texas.

Net crude-oil production per day in 1948 was 368,300 bbl., compared to 343,200 in 1947; natural-gas liquids, 16,500 bbl., compared with 14,800 bbl. in 1947; natural gas sold, 126,947,000,000 cu. ft., compared with 90,655,000,000 cu. ft. a year earlier. At close of 1948 the company was operating 9,436 wells, compared to 9,011 at the close of 1947.

The company invested more than $12,000,000 in new and improved facilities in its program to conserve and utilize natural gas. Construction work was begun on several new plants which will be completed this year, including plants at Jourdanton, Seeligson, Kelsey, and Pickton, Tex.

Volume of oil delivered by Humble Pipe Line Co. in 1948 was nearly one-fourth larger than in 1945, the peak war year. Gathering and trunk-line tariffs have remained practically constant since 1942, and increase in volume has served to offset only partially the trend toward higher costs, with the result that earnings have declined substantially. A total of 758,600 bbl. daily of finished products, crude, and natural gasoline was sent through the pipe line system in 1948 compared with 694,000 bbl. daily in 1947.

Large expenditures were made for new refining facilities at Baytown to increase efficiency and reduce operating costs. Construction was begun during the year on a new pipe still, with capacity of 45,000 bbl. daily. The company refineries handled an average of 249,300 bbl. of crude daily in 1948, compared with 227,400 bbl. in 1947.

Humble's net earnings for 1948 were $186,069,000, and dividends were paid on stock at $4.00 per share. The firm retained $114,166,000, or 61 per cent, in the business.

Annual Reports

With this issue, The Journal concludes its summaries of operations of oil companies during 1948 as revealed in their annual reports. A complete financial report of all major companies appeared in the May 5 issue, page 48.

Mid-Continent Set Many New Records

NEW records in all divisions of Mid-Continent Petroleum Corp., Tulsa, were made during 1948, as the firm witnessed increased crude-oil production, greater refinery runs, refinery expansion, and an increase in pipeline facilities.

According to the annual report, Mid-Continent spent a total of $23,498,991.43 during the year in adding substantially to its facilities, including improvement of equipment already on hand, and the major refinery-expansion program at the company's West Tulsa refinery.

Crude-oil production, which increased from 4,559,020 bbl. in 1943 to 7,897,605 bbl. in 1948, recording a gain of 73 per cent, was up 1,724 bbl. in daily output over 1947's figure (21,578 bbl per day in 1948 as compared with 19,854 bbl. per day in 1947). The company drilled 178 wells, of which 86 were oil wells, 7 service wells, and 36 dry holes on leases where Mid-Continent owned the entire working interest; 18 wells, 11 gas wells, and 20 dry holes on partnership properties.

Refinery runs increased from 9,865,588 bbl. in 1942 to 15,483,819 bbl. in 1948, which represents an increase of 57 per cent. The daily-run average in 1948 was 42,306 bbl. compared with 35,415 bbl. in 1947.

Pipe-line runs reached a new high in 1948 of 18,398,725 bbl. as compared with 17,541,795 bbl. in 1947. Total number of miles of pipe line in operation at the close of 1948 was 1,530 compared with 1,436 miles at the end of 1947. Mid-Continent Pipe Line Co. is a wholly owned subsidiary of the parent company.

Shipments by tank car and truck in 1948 were equivalent to 90,991 cars, a new record compared with 85,489 cars in 1947.

Terming the year 1948 as "the best in its history," the firm's annual report stated that income for the year, after provision for all taxes and other charges, was $24,681,992.77, compared with income of $18,638,932.38 in 1947. Earnings during 1948 on the company's stock was $13.28 per share, compared with $10.03 per share in 1947.

Huge Expenditures Made By Socony During 1948

EXPENDITURES for properties, plant expansion and modernization, and new equipment by Socony-Vacuum Oil Co., Inc., amounted to $194,300,000 during 1948, the company's annual report discloses. Of this total, $172,200,000 was spent in the United States, of which $96,500,000 went for production purposes.

The report estimates that capital expenditures by the company during 1949 will be less than those of 1948, or approximately $175,000,000.

Production of crude oil was higher than at any previous time, with gross output in the United States alone amounting to 210,000 bbl. daily. This compares with 190,000 bbl. daily in 1947. The firm increased its domestic reserves from 1,141,000,000 bbl. at the end of 1947 to 1,194,000,000 bbl. at the close of 1948, in spite of increased production.

The company's subsidiaries in Venezuela and the Middle East also reported increases in production. Venezuela's output added 30,500 bbl. daily to the company's 1948 total, and in the Sinai Peninsula in Egypt, company interests accounted for an additional 7,000 bbl. of crude daily.

Exploratory activities continued at an all-time high during the year. The firm drilled a total of 813 wells, of which 614 were oil wells, 95 gas wells, and 104 dry holes. Of this total, 71

were wildcat ventures, resulting in 15 oil wells, 8 gas wells, and 48 dry holes.

Refineries set a record during the year by processing an average of 472,000 bbl. of crude daily, or 12,000 bbl. daily more than in 1947 and 60,000 bbl. daily more than in 1946. Major projects for replacement and expansion, and for product improvement will be completed this year at refineries in Casper, Wyo.; East St. Louis, Ill.; Torrance, Calif.; Beaumont, Tex.; Paulsboro, N. J.; and in Brooklyn. Capital expenditures for these projects during 1948 and 1949 will total approximately $60,000,000.

In June 1948, the 647-mile 20-in. pipe line from Corsicana, Tex., to Patoka, Ill., was put into operation, at a capacity of 100,000 bbl. daily. Two product pipe lines were completed late in the year, including a 6-in. line from Portland to Bangor, Me., a distance of 127 miles, and a 155-mile pipe line from Malvern, Pa., to Binghamton, N. Y.

The firm transported 20,000,000 bbl. more crude and finished products during 1948 than in 1947. At close of the year, Socony-Vacuum owned and operated 18,300 miles of trunk and gathering lines.

Carrying on its intensive research program, Socony-Vacuum developed a new type of Thermofor catalytic cracking unit, which will reduce investment costs and make possible production of higher quality petroleum products.

Earnings for 1948 were $132,800,000, equivalent to $4.18 per share, compared with $97,700,000, or $3.13 per share, earned in 1947.

Gulf Added to Reserves Substantially in 1948

OUTLOOK for the petroleum industry appears to be one of further increases in volume, but with lower prices for some products and consequent lower profits, S. A. Swensrud, president, Gulf Oil Corp., told stockholders in the company's annual report for 1948.

The company's report shows that records were set in crude-oil production, refinery runs, pipe-line transportation, exploration, and development. The company's earnings were greater during 1948 than in any previous year.

Gulf spent a total of $239,500,000 during 1948 for plant and related investments, as compared with $180,000,000 in 1947.

Gross crude-oil production during the year was 193,323,000 bbl., with record production of 100,206,000 bbl. coming from properties in the United States, 69,294,000 bbl. from Venezuela and 23,273,000 bbl. from Kuwait.

The company's net production during 1948 amounted to 86,154,000 bbl. in the United States, an increase of 9 per cent over 1947. Daily average net production for both domestic and foreign operations was 454,722 bbl., compared with 389,404 bbl. in 1947, and 354,012 bbl. in 1946.

The firm continued its active exploration in the United States, Venezuela, Kuwait, Denmark, Colombia, Nicaragua, Cuba, and Mozambique.

A total of 811 new wells were drilled in the United States, and 216 in foreign areas. Approximately 85 per cent of the wells were producers of oil or gas. In the United States 14 discoveries were made by the 62 exploratory wells drilled during the year, and 14 new producing horizons in old fields were discovered by 38 wells drilled for that purpose.

Estimated proven reserves of crude in the United States at end of 1948 were 1,276,000,000 bbl., compared with 1,100,000,000 bbl. at the end of 1947. Gulf's interests in proven reserves in Kuwait are estimated at well over 5,000,000,000 bbl.

Records were also set in production of natural gas. During 1948 a total of 145,000,000,000 cu. ft. of gas was produced and saved, and of this, 117,000,000,000 cu. ft. was sold for a gross revenue of $5,086,000. This compares with sales of $3,360,000 in 1947.

Gulf processed 140,500,000 bbl. of crude, an average of 384,000 bbl. daily, in its eight refineries. This compares with 134,900,000 bbl., an average of 369,600 bbl. daily, in 1947.

Several of the company's refineries were expanded to increase capacity, and others were modernized. A modern refinery is being built at Puerto La Cruz, Venezuela, by Venezuela Gulf Refining Co., a wholly owned subsidiary.

The company's consolidated net earnings for 1948 were $153,539,299, equal to $13.53 per share on 11,345,250 shares outstanding at year's end. This compares with $95,540,059 in 1947, or $10.53 per share on 9,076,200 shares then outstanding.

Two New Coal-to-Oil Plants Demonstrated

(Continued from page 58)

between adjacent converters, the structure provides protection to operating personnel in the event of fire or explosion. These compartments, called "stalls," are open at their tops and on one of their sides. All of the converters operate at 10,300 psi. pressure and at temperatures ranging from more than 600° F. to above 900° F. in the catalyst basket.

Gas Synthesis Process

A gas-synthesis unit is the second process unit installed at the site. Cost of the new gas-synthesis demonstration plant on contract basis is $5,000,000. Designed and erected by Koppers Co., Inc., the unit has a nominal rating of 80 to 100 bbl. per day. The process is adapted to production of motor gasoline or diesel fuels at costs approximating those of the hydrogenation operation.

Solutions to many of the problems involved in producing synthetic liquid fuels are expected to be found in the operation of these demonstration plants. A number of the important advances made in the bureau's research program on gas synthesis methods are incorporated into the design of the new plant.

Pulverized coal is also the raw feed material for the gas-synthesis plant. Gasification of the coal, the first of four separate operating steps in the process, is accomplished with oxygen and superheated steam. The synthesis gas resulting from this operation is a mixture of carbon monoxide and hydrogen. In the second operating step the gas is purified, then for step three the hydrocarbon synthesis operation is carried out, and in the final phase refining of the liquid product occurs.

Oxygen for processing operations of the plant is produced with a Linde-Frankl unit imported from Germany. Before being placed in operation the oxygen generator was thoroughly reconditioned. In extracting oxygen from air the process operates at temperatures more than 300° F. below zero.

Operations in the first step of the gas-synthesis process, following the pulverizing and drying of the coal, are carried out at temperatures upwards of 2,000° F. The pulverized coal, suspended in oxygen, is fed continuously into the gasifier chamber along with superheated steam. The plant's gasifier chamber is refractory lined and measures approximately 6.5 by 9 ft. inside dimensions.

Conversion of the gas to liquid fuels, after its purification, is carried out in two new-type converters developed in the bureau's laboratory. As contrasted with the German type converters these new type units may be constructed for capacities approximately 30 times greater. Each of the bureau-developed converters is equipped with a cooling system for removing rapidly the heat of the synthesis reaction. Cooling in one of the converters is accomplished by circulating oil through a fixed bed of granular catalyst. In the other unit, the oil-catalyst slurry converter, cooling is effected by passing the gas through a rapidly circulating slurry of coolant oil and powdered catalyst.

Converter production is treated in the refining phase of the operation, the last step in the gas synthesis process. Here the liquid is distilled and fractionated into various products ranging from heavy oils and waxes to propane. Normal daily yield is in the order of 5-10 bbl. of propane, 55 bbl. of finished gasoline, 10 bbl. of diesel oil, and 12 bbl. heavy oils and waxes.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED MAY 7, 1949

	Total of all wells					18 wk.		Wildcat completions and discoveries									
													Cumulative total, 1949				
	Comp.	Oil	Gas	Dry	Footage	1949	1948	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	25	13	0	*12	25,043	428	525	0	0	0	0	0	0	0	0	0	0
Pennsylvania	27	13	0	†14	44,060	614	919	0	0	0	0	0	0	0	1	1	2
West Virginia	6	0	5	1	16,786	171	253	0	0	0	0	0	0	0	4	5	9
Ohio	20	6	8	†6	46,321	365	417	0	0	0	0	0	1	0	2	14	17
Indiana	34	17	1	16	71,547	365	314	1	0	0	5	6	6	0	0	76	82
Kentucky	15	10	0	5	32,701	‡278	201	0	0	0	1	1	4	0	0	14	18
Illinois	44	26	0	18	107,406	665	619	0	0	0	8	8	10	0	0	114	124
Michigan	12	6	0	6	21,930	306	198	1	0	0	4	5	13	0	1	110	124
Kansas	56	35	0	21	185,794	957	881	1	0	0	7	8	19	0	2	116	137
Neb., Mo., Iowa	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	8	8
Oklahoma	92	41	6	§45	907,212	1,345	1,274	5	0	1	14	20	54	7	6	183	250
Texas	252	153	17	82	1,110,691	4,392	3,649	4	2	4	46	56	145	16	40	755	956
North Central (Dist. 7-B & 9)	85	40	2	43	268,055	1,428	1,114	1	0	1	24	26	71	0	7	295	373
West (Dist. 7-C & 8)	64	55	0	9	329,681	969	980	2	0	0	3	5	19	0	0	63	82
Panhandle (Dist. 10)	17	12	5	0	51,580	355	194	0	0	0	0	0	1	0	0	1	2
Eastern (Dist. 5 & 6)	15	5	4	6	84,187	241	174	0	0	1	3	4	1	1	3	44	49
Gulf Coast (Dist. 2 & 3)	36	20	6	10	244,277	658	579	0	2	2	6	10	29	10	18	135	192
Southwest (Dist. 1 & 4)	35	21	0	14	132,911	741	608	1	0	0	10	11	24	5	12	217	258
Louisiana	46	29	4	13	280,490	679	631	1	1	0	9	11	17	5	1	65	88
Northern	22	14	4	4	58,801	347	410	0	0	0	3	3	1	0	0	28	29
Southern	24	15	0	9	221,689	332	221	1	1	0	6	8	16	5	1	37	59
Arkansas	6	5	0	1	23,258	95	100	0	0	0	1	1	3	0	0	23	26
Mississippi	6	4	0	2	44,631	124	129	0	0	0	0	0	3	0	1	32	36
Southeastern States	1	0	0	1	3,508	20	15	0	0	0	1	1	1	0	0	18	19
Montana	6	3	1	2	21,186	67	76	0	0	0	0	0	1	0	1	6	8
Wyoming	15	9	0	6	77,871	195	134	0	0	0	3	3	9	0	0	33	42
Colorado-Utah	3	1	0	2	12,417	42	81	0	0	0	2	2	1	0	0	16	17
New Mexico	18	11	3	4	76,910	193	212	1	0	0	2	3	3	0	0	16	19
California	54	43	1	10	205,525	921	943	1	0	0	8	9	17	0	2	158	177
Total United States	738	425	46	267	3,311,287	12,232	11,571	15	3	5	111	134	307	28	61	1,763	2,159
Total previous week	‡700	401	‡55	244	2,634,326	‡11,507	10,789	23	1	4	99	127	292	25	56	1,652	2,025
Total May 8, 1948	782	464	48	270	2,585,867			24	1	3	97	125	248	23	94	1,573	1,938

Service wells included: *12, †13, ††1, §2. ‡Revised.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.96			
19-19.9	2.07			
20-20.9	2.17	$2.25		$2.12
21-21.9	2.23	2.27		2.14
22-22.9	2.27	2.29		2.16
23-23.9	2.30	2.31		2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. (For detailed price changes in all fields see The Oil and Gas Journal, January 1, 1948, page 107.)

A.P.I. REFINERY REPORT, APRIL 30

District—	Crude runs, daily avg.	(Thousands of barrels) Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	773	2,271	191	1,372	1,221	27,720	8,137	17,318	10,392
Appalachian:									
District 1	86	272	57	76	72	2,736	356	591	448
District 2	73	255	38	48	107	1,204	124	218	279
Ind., Ill., Ky.	929	3,284	356	901	1,078	28,381	2,697	7,579	4,981
Okla., Kans., Mo.	391	1,504	150	511	442	13,005	1,012	3,135	2,132
Inland Texas	213	954	74	145	334	4,896	443	688	960
Texas Gulf Coast	1,252	4,422	509	1,592	1,530	18,416	2,776	8,686	8,028
La. Gulf Coast	404	1,654	284	667	339	6,130	2,116	2,810	2,143
N. La. and Ark.	82	197	39	108	109	2,397	381	897	169
Rocky Mountain:									
New Mexico	14	52		12	27	83	25	36	35
Other Rocky Mtn.	142	405	27	170	236	3,636	255	1,134	915
California	914	2,699	112	1,079	2,688	16,193	600	6,867	29,692
April 30, 1949‡	5,273	17,969	1,837	6,681	8,185	124,787	18,922	49,959	60,174
April 23, 1949‡	5,188	17,595	1,915	6,087	8,246	124,749	18,361	49,775	60,207

*Finished and unfinished. †At refineries including natural blended. ‡Comparable data for 1948 on new basis not available.

Bureau of Mines crude-oil stocks 269,831,000 bbl. as of April 23—down 120,000 bbl. One year ago 228,488,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.			
East Texas†	$2.65	Pecos County, Texas (Yates)	2.35
Kettleman Hills, California*	2.64	Bradford, Pennsylvania	3.40
Beauregard Parish	2.60	Eastern Ill. and Western Ind.†	2.77
Illinois Basin	2.77	Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	May 7 crude oil	B. of M. April demand	April 30 crude oil
Alabama	1,150	1,500	1,150
Arkansas	80,750	84,000	81,550
California	943,700	950,000	942,300
Colorado	65,500	53,000	62,900
Eastern	62,000	61,350	61,400
Florida	1,425	1,300	1,475
Illinois	179,100	165,000	175,300
Indiana	25,300	22,000	23,700
Kansas	282,550	290,000	286,700
Kentucky	23,600	21,000	23,100
Louisiana	502,000	478,000	494,950
North Louisiana	117,400	.....	117,950
South Louisiana	384,600	.....	377,000
Michigan	45,250	45,000	41,050
Mississippi	104,650	125,000	105,900
Montana	26,200	24,000	26,300
Nebraska	300	700	300
New Mexico	129,825	125,000	131,800
Oklahoma	429,500	415,000	424,900
Texas	1,884,600	2,370,000	1,911,300
Dist. 1 (Southwest)	25,690	.....	25,210
Dist. 2 (Southwest)	118,675	.....	120,950
Dist. 4 (Southwest)	184,350	.....	185,250
Dist. 3 (Gulf Coast)	357,210	.....	363,115
Dist. 5 (Eastern)	34,475	.....	35,575
Dist. 6 (Eastern)	83,525	.....	84,550
East Texas field	247,400	.....	253,600
Dist. 7-C (West)	42,225	.....	42,525
Dist. 8 (West)	520,150	.....	535,725
Dist. 7-B (W. Central)	56,725	.....	58,600
Dist. 9 (N. Central)	125,400	.....	118,500
Dist. 10 (Panhandle)	88,775	.....	87,700
Utah	400	150	300
Wyoming	122,500	138,000	122,200
Total United States	*4,910,300	5,370,000	4,918,575

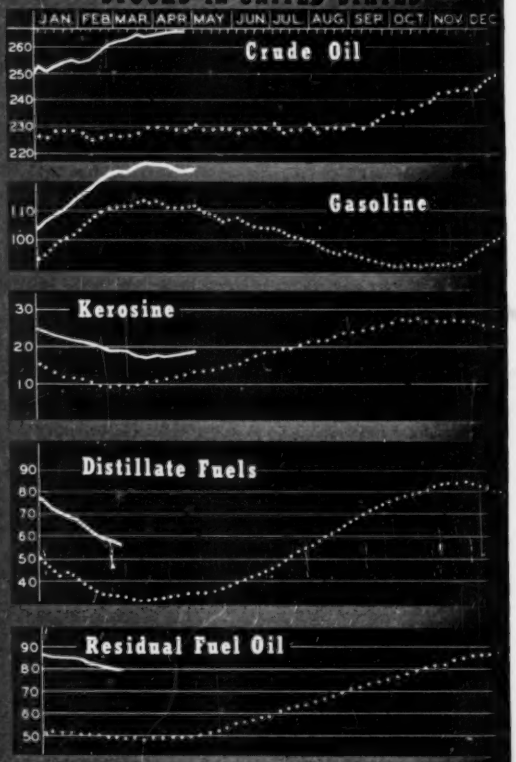
Change from prev. wk., dn. 8,275

Total production January 1-May 7 ..... †669,583,765 bbl.

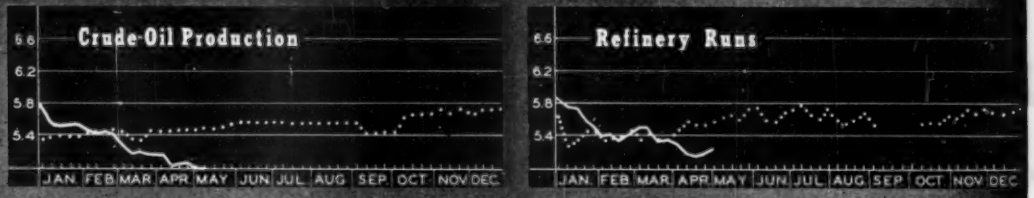
Same period last year (crude plus cond.) ..... 694,488,220 bbl.

*Net, incl. 82,910 bbl. condensate. †Incl. 10,809,235 bbl. condensate.

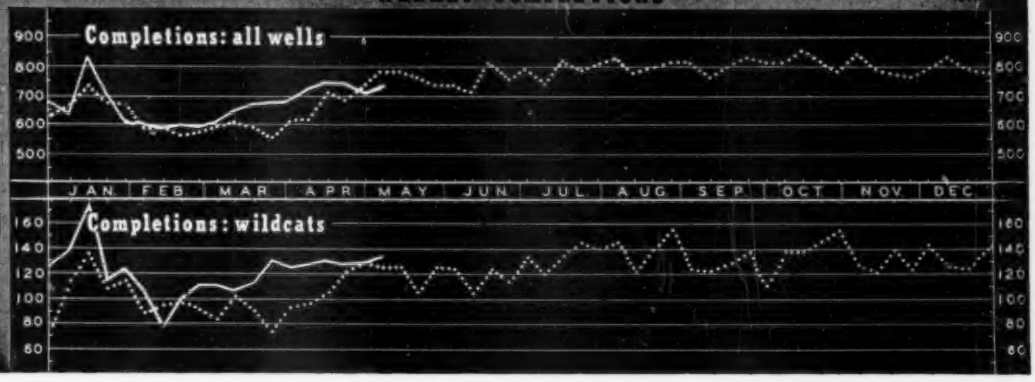
STOCKS IN UNITED STATES



DAILY OPERATIONS



WEEKLY COMPLETIONS



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McGREGOR WORKING BARREL CO.
BRADFORD, PA.

MARKETS

THE outstanding development of the week in petroleum marketing was the announcement of Esso Standard Oil Co.'s decision to resume its system of maximum price guarantees over an extended period to contract buyers of heavy fuel oil.

Esso was offering 3-year contracts to supply heavy fuel oil with a provision insuring the customer against a price advance of more than 40 cents through the end of 1949, more than 55 cents through June 1950, or more than 70 cents through the end of 1950. With the current heavy-fuel price at $1.75 per barrel, this means that the company is guaranteeing these contract buyers that the price will not go above $2.45 in the next 19½ months compared with a price level of $3.03 early in 1948.

The company's move, resuming a plan in effect before the war and for a short time afterwards, was expected to be followed by other major suppliers. It represented another step in the effort to encourage conversion from coal to oil and to increase the demand for heavy fuel.

If prices of coal and heavy fuel in the New York area are compared on the basis of price per B.t.u., coal had an advantage in the period from the end of the war to early 1949. Since coal and residual fuel are direct competitors in many industries, buyers will examine these guaranteed maximum prices in terms of equivalent coal prices.

The current heavy fuel price of $1.75 per barrel gives residual a price advantage over coal as long as coal sells for $7.20 per ton or more in the New York Harbor area. Fuel at the maximum of $2.15, guaranteed until the end of this year, would compete with coal at about $8.80 per ton, and the maximum of $2.30 through June of next year would be equivalent to coal at $9.40.

Some large industrial users are equipped to burn either coal or heavy fuel and shift to the one with the price advantage. Other users, knowing that certain costs are involved in the change, have not converted to fuel oil for fear that the present price advantage may be temporary. The return of a guaranteed maximum price through a given period may change some of these to oil users.

The market in both distillate and residual fuel oil appeared to be firmer late last week in New York Harbor, but some price cutting continued at the retail level. Motor fuel prices were unchanged, but reports varied on the extent of early season demand.

Gulf Coast Gasoline Moves

Quite a little "flurry" in buyer interest and sales of gasoline in the Gulf Coast products market was reported last week by one marketer. Shipping orders were withheld by some purchasers to see if recent higher gasoline prices in certain areas would hold.

Movement of distillate was very slow. However, no weakening in the price level was evident and it appeared that the present prices would hold, according to several suppliers. One buyer was reported to be seeking No. 2 at 6¼ cents per gallon without success. Other marketers reported some material available at that figure or even lower.

In the Mid-Continent and North Central areas, gasoline demand continued very strong with stocks declining more than 100,000 bbl. per day in a recent week when stocks recorded a slight gain for the nation as a whole. Distillate movement, except for diesel, was very slow. Natural gasoline prices were very firm and movement to refineries has been good, reflecting increased demand for motor fuel.

Representative Quotations

Representative spot-market quotations of leading suppliers as of May 9, 1949. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Tex. Gulf Coast
Regular gasoline, 73-75 octane	9½-9¾	11.5	9¼-10
Premium gasoline, 78-80 octane	10¼-10⅞	12.5	10¼-11
42-44 w.w. kerosine	8-8½	8.3-9.3	7¾-8½
No. 2 straw fuel oil	6¾-7	7.0-7.4	6⅜-6½
No. 6 residual	$0.90-1.00	$1.65-1.75	$1.20-1.30

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5¼	4¾	5
Grade 18-55	6.3	5.7	6.0

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	11
750 vis., No. 3-4 neutral	14
2,000 No. 5-6 neutral	16-16.5

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19
200 vis., No. 3 neutral, 0-10 pp.	14

Western Pennsylvania

144-155 vis. 10 p.t. bright stock	21.5
180 vis., 0 p.t. neutral	20.5

CRUDE-SCALE WAX
Mid-Continent

132-134 A.M.P.	5

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EQUIPMENT MEN . . . in the News

Davis Bovaird Succeeds Brother As Firm President

DAVIS BOVAIRD

Davis D. Bovaird, until now treasurer and vice president of Bovaird Supply Co., has been elected president to succeed his brother, W. M. Bovaird, who died April 27.

Davis Bovaird joined the pioneer oil-well supply firm after graduation from University of Michigan in 1920 and in 1927 became manager of the company's manufacturing plant. He was made credit manager in 1927 and transferred from Independence, Kans., to Tulsa.

The new president, together with his brother, F. D. Bovaird, vice president; Roscoe G. Ayers, vice president and general manager of sales; R. M. McMahan, secretary-treasurer; and A. E. Booth, of Bradford, Pa., comprise the new board of directors.

The firm was founded in 1871 by David Bovaird, who was succeeded by his three sons, W. J., Walter, and J. H. Bovaird. The three sons of W. J. Bovaird represent the third generation of Bovairds in the firm.

Paddock to Direct Burgess-Manning Petroleum Sales

S. G. Paddock, who has been with the parent company, Burgess Battery Co., or its subsidiaries, for the past 14 years, has been appointed sales manager of the newly organized and expanded petroleum division of the present Burgess-Manning Co., Libertyville, Ill.

Paddock acted in an engineering capacity in the Madison, Wis., and Chicago areas from 1935 to 1937. During 1937 he was transferred to New York City as a sales engineer for the acoustic division. In 1940, Paddock was sent to Tulsa to study the application of Burgess-Manning products to the oil industry.

From 1941 to 1945, he acted in an engineering capacity for the company in the Cleveland area. In 1945 Paddock returned to Chicago to become assistant sales manager. He has handled this responsibility until his recent promotion to sales manager of the petroleum division.

Pell Made Global Packing Company Sales Manager

Global Packing Co. has announced the appointment of Duncan C. Pell as its sales manager. At present Pell is reviewing the field of potential distributors for Latin American countries and expects shortly to announce the names of firms which will market the full line of Global mechanical packings, asbestos cloth, and asbestos insulations.

Bertram Made Manager of Sales for Brown Fintube

E. A. BERTRAM

John W. Brown, Jr., president of Brown Fintube Co., has announced the appointment of E. A. Bertram as manager of sales for the company. In his new capacity he will be in charge of all selling of the company's products in the petroleum and chemical industries through its representatives in the principal cities of the United States.

Bertram is a graduate of University of Illinois and also received a M.S. degree in chemical engineering from California Institute of Technology. Prior to his new association, Bertram was industrial division manager of National Radiator Co., and was previously connected with Lummus Co. as chief engineer of the heat exchanger department.

Hampton and McCaskill Join Visco Field Staff

Visco Products Co., manufacturer and distributor of emulsion-breaking chemicals for dehydrating petroleum crude oil and desalting chemicals for desalting charge stocks in refinery operations, has added two men to its field staff.

J. W. Hampton has been assigned to the staff and will make his headquarters at Duncan, Okla. The other addition, B. M. McCaskill, Jr., is making his headquarters in Tyler, Tex.

Layritz and Sardieck Get Lunkenheimer Promotions

Harry A. Burdorf, vice president in charge of sales for Lunkenheimer Co., announces the appointment of Harold

H. H. LAYRITZ

R. J. SARDIECK

H. Layritz as sales manager and of Roland J. Sardieck as assistant sales manager.

Layritz is a graduate of University of Cincinnati and joined Lunkenheimer in 1920. He has a wide background of experience in the factories, general offices, and sales division. His most recent capacity was that of assistant sales manager.

Sardieck came with Lunkenheimer in 1918. He served in various capacities in the factories, offices, and sales and then was transferred to the Philadelphia branch office as assistant manager. In recent years he has been Philadelphia branch manager.

Griscom-Russell Announces Executive Changes

Russell C. Jones, president of Griscom-Russell Co. since 1939 and associated with the company for 40 years, has retired as president but will continue to act as director. After accepting his resignation, the board of directors elevated Kenneth B. Ris, vice president in charge of sales, to president to succeed Jones.

At the same meeting, Charles D. Steffens, who has been sales manager, was elected vice president in charge of sales, and James W. Elizardi was elected vice president in charge of petroleum sales.

Jones entered the Griscom-Russell New York sales department in 1909, and was successively Canadian managing director, New York sales manager, manager of marine sales, vice president in charge of all sales and director, before becoming president.

British Firm Will Make Oil Center Tool Products

Oil Center Tool Co. has recently licensed LeGrand, Sutcliff & Gell, Ltd., for the manufacture of O-C-T products in England, according to John Maher, president of Oil Center Tool.

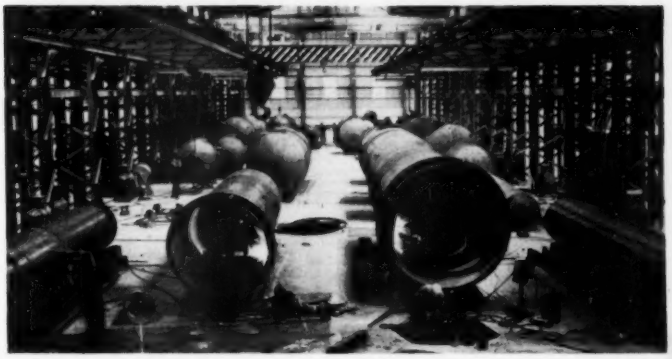
"In the process of exporting equipment to oil companies carrying on development and drilling operations throughout the world," Maher said, "we have learned that those firms doing business on a pound-sterling basis were handicapped in making adequate dollar purchases of desired American-designed equipment."

Oil Center Tool has made available to the LeGrand organization all technical help and advice to insure that LeGrand O-C-T products fully meet all material specifications and inspection requirements. LeGrand, Sutcliff & Gell is a firm of long standing in the manufacture of well-drilling equipment. For many years it has operated a large manufacturing plant and foundry at Southall, Middlesex. After the close of the war, it converted an aircraft factory at Rochester, Kent, into an oil-tool plant for the manufacture of oil-field pumping units, rod elevators, polished-rod grips, tubing spiders, casing heads, tubing heads, and similar other field equipment.

Bethlehem Shifts Daigle

Bethlehem Supply Co. announces the transfer of M. A. Daigle, field representative, from Natchez, Miss., to Baton Rouge, La. Daigle has been with the company since March 1940 in the Louisiana stores, with the exception of 4 years in the Navy. He was a student at Louisiana State University prior to coming with Bethlehem Supply.

National Tank Co.'s Modern Plant at Tulsa



The treater bay shown above is but a small part of the tremendous new plant recently opened by National Tank Co. at Tulsa. New equipment includes, among other facilities, three 5-ton floor cranes, four 5-ton cab traveling cranes, six 10-ton cab traveling cranes, two 50-ton cab traveling cranes, a 400-ton hydraulic press, head and plate furnace, two annealing furnaces, a 2½-in. capacity plate-bending roll and X-ray equipment for plate up to 20 in. thick

R. S. Terhune Made Nelson Electric Sales Manager

Nelson Electric Manufacturing Co., Tulsa, has announced the appointment of R. S. Terhune as sales manager. In addition to directing sales activities in the Tulsa area, he will lend assistance to the company's sales agents who are located throughout the nation.

R. S. TERHUNE

For the past 5 years Terhune has served Nelson as an electrical engineer, specializing in generator and power switchgear. Previously, he was associated with the E. I. du Pont de Nemours & Co., Inc., as an electrical engineer on construction, maintenance, and production.

Welex Jet Services Opens New Houston Station

The jet method of oil-well perforating is now available to operators in the Houston and South Texas area from the originators of the process, Welex Jet Services, Inc., who has opened a station at Houston.

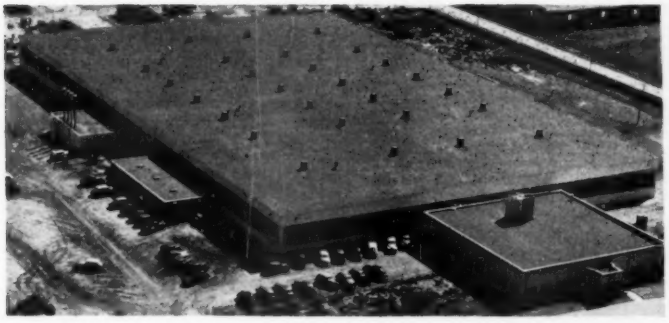
Cecil Puryear will manage the new station. He was formerly station manager of the Welex branch at Wichita Falls and before that worked with Lane-Wells Co. and McCulloch Tool Co. Sales manager of the Houston station will be Kenneth Daggett who comes from the Welex office in Fort Worth.

Barnard Joins Lane-Wells As Personnel Manager

Hollis L. Barnard has been appointed assistant personnel manager for Lane-Wells Co., technical oil-field service firm. Barnard, prior to this appointment, was assistant personnel director at Rheem Manufacturing Co., Southgate, Calif. Prior to World War II he was with Stewart-Warner Corp., Chicago, as a time-study engineer.

Lane-Wells also announces the opening of a new truck station at Jacksboro, Tex. R. W. Richardson will be in charge. Complete facilities for perforating, radioactivity well logging, and setting of packers and drillable bridging plugs will be available from this new station.

New Dallas Plant of Fritz W. Glitsch & Sons



Fritz W. Glitsch & Sons, Inc., has just moved into this new plant in Dallas. The main plant building is 270 by 400 ft. and the offices cover 90 by 100 ft. Hans C. Glitsch estimates the new facilities will handle more than four times the old plant output. The new plant includes facilities for integrated manufacture of carbon steel and alloy trays and caps, tower internals, and pressure vessels

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 12 cents a word. Minimum charge, $3.00 per insertion.
Centered Line, any ad, $1.00.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$12.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE: Wilson Giant draw works powered by 3—J.L.-1335 Buda engines and Wilson chain compound. Like new condition, with bargain price. Terms. Melton Supply Co., Seminole, Okla.

STEEL STORAGE TANKS

Railroad Tank Car Tanks
6,500 to 12,000-Gal. Cap.
Coiled and Non-Coiled
Cleaned—Painted—Tested
Heavier—Safer—Cheaper
Other Tanks Too
Also—Complete Tank Cars
8,000 and 10,000-Gal. Cap.

Your Inquiries Solicited

NEWHALL-MARSHALL-WOOD, INC.
30 Church Street, New York 7, N. Y.
Phone: COrtlandt 7-8999

EQUIPMENT FOR SALE

FOR SALE: Model "K" Cardwell, single drum draw works powered by G.A.K. Waukesha engine. Equipped with 98' "A" mast and sub skid. Priced for quick sale. Terms. Melton Supply Co., Seminole, Okla.

FOR SALE: Star 45C Heavy Duty Spudder powered by D 13,000 skid mounted Caterpillar diesel, steel A mast, and all necessary 13 inch, 10 inch, and 8 inch long joint seamless big hole pipe with or without tools and wire line. P.O. Box 149, Eureka, Kansas.

FOR SALE: 1 U-10 Unit Rig Complete with 96' mast. Ready to drill a well. Very reasonable. S. E. Frogge, Tel. 6-5518, Box 4455, Oklahoma City, Okla.

MODEL 53 Keystone well drill mounted on 1946 Ford tandem drive truck. Excellent condition throughout. Sacrifice price. R. B. McElwaine, Box 127, Little Rock, Ark.

TANK CAR TANKS

10,000 Gallon Capacity
ONLY $945.00 ea.
In excellent condition . . . with or without heater coils
Thoroughly steam cleaned
Only 17 Left

CALUMET IRON & SUPPLY CO.
East Chicago, Indiana

FOR SALE

NEW CASING AND LINE PIPE

25,000'	5½" 15½# 8RT J55 R2 API Smls. Casing
15,000'	7" 23# 8RT J55 R2 API Smls. Casing
6,000'	8⅝" 28# 8RT J55 R3 API Smls. Casing
4,841'	9⅝" 36# 8RT J55 R2 API Smls. Casing
7,015'	10¾" 40½# 8RT J55 R2 API Smls. Casing
19,000'	(893 Joints) 6" Std. Byer's Wrought Iron L.W. Plain End Pipe (ASTM A72-33)

Above subject to prior sale.

THE NATIONAL COOPERATIVE REFINERY ASSOCIATION
P.O. Box 770 McPherson, Kansas
Phone 820

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

WELL drilling spudders, beams, light rotaries, core drills, tools, casing. Used equipment at money saving prices. Spang and Mills new tools. Leschen lines. Everything for well drilling. Pressey & Son, Pueblo, Colo.

NEW CENTRIFUGAL PUMPS

Byron Jackson—Aurora—Lombard—Gould—Hale—Gorman Rupp—Wayne & Novo, complete with engine power, also 1½ to 20 KW light plants. H. A. McCarthy, 310 Thompson Building, Tulsa, Oklahoma.

FOR SALE—Franks Model FA with automatic chuck, complete with watertruck and all equipment. Mounted on late 2-ton trucks. Due to other interest will sell very reasonable. Box C-913, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Range 1, used Lapweld Casing, Sizes 4" to 10", also a large amount of Tubing and Line Pipe. Location: West Virginia. Pipe Pulling & Plugging Company, Box 213, Charleston, West Virginia.

FOR SALE: Insley K-12 Back hoe, same as new, only five months old. If interested call: Paul Haines, Jacksboro, Texas, Phone 8 or at Marion, Kansas, 478-J.

BIG INCH PIPE
NEW LOW PRICES

5,200'	14"	O.D.	$2.25 per ft.
5,100'	16"	O.D.	$2.35 per ft.
725'	18"	O.D.	$3.50 per ft.
7,715'	20"	O.D.	$4.00 per ft.

Used in Excellent Condition

CALUMET IRON & SUPPLY CO.
East Chicago, Indiana

FOR SALE

12—230 H.P. Type 10 Bessemer New 17" Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 455, Evansville, Indiana

NEW EQUIPMENT FOR SALE

3—75 HP Westinghouse Electric Motors, Frame 752-C, 60 Cycle, 440 Volt, Style 4N-1987, Splash proof @ $1,474.00 each F.O.B. Douglass, Kansas.

6—50 KVA Westinghouse Transformers, Style 1191628, 7200/12470Y Voltage @ $589.00 each F.O.B. Douglass, Kansas.

Write or call

MORRISON PRODUCING COMPANY
Drawer 712, El Dorado, Kansas, Phone 314

WE OFFER, SUBJECT TO PRIOR SALE

9,550'—4½" OD 9.50#, 10-V thd, Smls Steel, range 2, casing, used @ 65c per ft.

3,220'—5½" O.D. 8-R thd, 14#, smls steel, range 2, casing, used @ $1.40 per ft.

5,000'—2" 4.70#, upset, 8-R thd, smls steel, range 2, tubing, used @ 51c per ft.

6,300'—3", 9.30#, upset, 10-v thd, smls steel, range 2, tubing, used @ 60c per ft.

17,000'—2", Line Pipe, T&C, used, @ 35c per ft.

1—Pumping Unit, Oil Well Type IC-20 (20 HP) used, $1,400.00.

210'—10¾" OD, 8 round thread, 32.75#, Seamless Steel, Range 2, NEW casing @ $3.50 per ft.

1,800'—7" OD 10-V thd, 24#, smls steel, Range 2 casing, used @ $1.60 per ft.

WEST SUPPLY COMPANY
Phone 196
Chase, Kansas

New CENTRIFUGAL PUMP UNITS

For Water, Crude and Petroleum Products

HIGHLY PORTABLE—EXTREMELY FLEXIBLE

PRICED AT LESS THAN HALF OF REGULAR COST

BYRON JACKSON "PUP" 2-stage Multiplex Centrifugal Pump direct connected to **CHRYSLER Model 36 (Ind. 9)** 8-cylinder Gasoline Engine, Mounted on rugged oil field type skid with necessary gauges and controls.

Designed for a wide range of operating conditions, this unit is particularly adapted to "pick-up" service in the oil fields, or other services where large variance in head and capacity are desirable.

Units are guaranteed to be in factory-new condition. Regular production models pump and engine. Parts readily available. Inquire for prices and specifications.

LUCEY PRODUCTS CORPORATION
OIL WELL SUPPLIES
TULSA, OKLAHOMA

EQUIPMENT FOR SALE

SAVE WITH SAFETY—Very Good Used Wire Line—Any Size or Length up to 5,000′—Respooled for Your Inspection—Cable Tools for Sale. General Tool & Supply Co., P.O. Box 4387, Phone 61335, Oklahoma City, Okla.

FOR SALE: 1 new patented Tom Dietle all steel, heavy duty casing pulling machine, 10″ x 55′ "A" mast—Double Drum—Double brake spudding attachment for ripping casing. I.H.C. motor, fully equipped, starter, 4-speed power transmission, also tools. Located Eureka, Kansas, Phone 1032, 917 North Elm or Tulsa: 2136 So. Yorktown, Phone 2-0061.

MANUFACTURERS LATEST DESIGN

Hydraulic Casing Pulling Units. Complete line of equipment. Units made to your specifications. Truck Mountings or Skid Units. Repair Service and Parts.

OKLAHOMA MACHINE & SUPPLY CO.
Ada, Oklahoma

Several Army Surplus 4½″ x 6″ Gaso Duplex 1860 Pumps—two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-86064—Houston, Texas

PACKAGED H_2S REMOVAL UNITS

We offer prompt shipment on skid-mounted hydrogen sulfide removal units for treating sour gas for pipe line or fuel gas purposes.

GRAFF ENGINEERING & EQ'PT. CO.
3415 Westminster, Dallas 5, Texas

USED PUMPING EQUIPMENT & PIPE

1—Buda Engine Model JK4 to Gaso Pump 2½″ x 5″ x 10″
1—Buda Engine JK4 to Wheatley Pump 8″ x 10″
1—Waukesha Engine CRS6 to Allis-Chalmers 15 KW-DC generator with starting equipment
115,000 ft. 6⅝″ OD 17.9# Seamless, Range 3, P.E.
80,000 ft. 4½″ OD 8.64# Seamless, Range 3, P.E.
50,000 ft. 6⅝″ OD 19.45# T&C, Lapweld
All A-1 Condition

W. C. BERRY
P.O. Box 1858, Tulsa, Okla., Phone: 3-6141

FOR SALE: NEW API CASING COUPLINGS

1,441—5½ O.D. 8 R.T. Long N-80
794—5½ O.D. 8 R.T. Short J-55
79—6⅝ O.D. 8 R.T. Long J-55
100—7″ O.D. 8 R.T. Long J-55
144—7″ O.D. 10-V Long J-55
15—8⅝ O.D. 8 R.T. Long J-55

Above subject to prior sale.

ROCK ISLAND OIL & REFINING CO., INC.
335 West Lewis Street Wichita, Kansas
Phone 7-3325

WE OFFER, SUBJECT TO PRIOR SALE, THE FOLLOWING

Approximately 26,000′ of New, 27⅛″, O.D. 6.5#, Externally upset, Range 2, threaded and coupled, seamless tubing, same as J-55, at $.70 per ft. f.o.b. Ft. Worth, Texas.

17,000′ of 2⅜″ O.D. externally upset, Range 1, 4.6#, seamless tubing, at $.45 per ft., f.o.b. Ft. Worth, Texas.

ROGERS AND WRIGHT, INC.
215 Wright Bldg.
Tulsa, Oklahoma
Ph. 5-3229

EQUIPMENT FOR SALE

FOR SALE: Fort Worth Jumbo-D Spudder, 4000 foot capacity. Complete string of tools, diesel engine, light plant. All in excellent shape. Priced to sell. Wm. J. Schmitt, Owensboro, Kentucky. Phone 2038.

TWO Complete Rotary rigs, 126′ masts, 6′ substructures, Blowout preventors. Fully equipped to start drilling. One Double Drum National 50 with Two Compounded Twins GM Diesel Engines and Parkersburg Hydromatic Brake. 1 Unit U-10 with 3 Compounded D13000 Engines. Equipment all in A1 condition. Located at Newcastle, Wyoming. Kiowa Drilling Company, Inc., 717 Union National Bank Building, Wichita 2, Kansas. Phone 3-8013.

BUCYRUS-ERIE 36L Spudder—A-1 condition. Will sell with or without complete set of tools, including complete set of casing tools. L. H. Bebout, Route 3, Newark, Ohio.

BLOWOUT PREVENTER—10″ Hinderliter type D.U. 4-M, 4½″ rams, 6,000 lb. Year old, used 45 days—$1500. Shaleshaker, Thompson Model SR. Less sample machine. Used 30 days—$550.00, Midwestern Drillers, 816 North Grant, Liberal, Kansas. Phone 960.

FOR SALE—STEEL STORAGE TANKS

7—55,000 bbl., Maud, Oklahoma
15—80,000 bbl., Hominy, Oklahoma
11—55,000 bbl., Mexia, Texas
27—80,000 bbl., Mexia, Texas

For further information, write

STANOLIND OIL PURCHASING CO.
Atten: L. M. Jones, Box 591, Tulsa, Okla.

10—35,000 bbl. steel storage tanks, shell and bottom, cut down, ready to load, Stoy, Illinois. Price $5,000.00 each.

W. C. BERRY
P.O. Box 1858, Tulsa, Okla., Phone: 3-6141

FOR SALE

Several used Pumping Motors in excellent condition—VIKU Waukeshas, HP336 Budas, and U318 Allis-Chalmers. Prices reasonable.

We specialize in rentals of Oil Field Equipment.

SOUTHERN PIPE & SUPPLY CO.
Justin 8-5525
P.O. Box 8051 Houston 4, Texas

Hydraulic casing pulling machine, mounted on 1½ ton Chevrolet truck, complete with telescope mast pole, all tools, slips, automatic break-out for pulling of 5½″, 7″, 8″ and 10″ casing. Also two ton Chevrolet truck, thirty ft. Nabors float trailer and new 1949 ¾-ton Chevrolet pick-up, all which goes to make up complete unit. Machine and equipment were all purchased new and have been in service approximately ten months.

WESTERN PIPE & EQUIPMENT CO.
922 Neil P. Anderson Building
Phone 2-5668 Fort Worth, Texas

FOR SALE: USED SEAMLESS STEEL CASING

Grade J-55, 8 R.T., Long T&C
6,201′—5½, 15.50#
2,994′—5½, 17#
2,686′—7″, 22#
10,416′—7″, 24#
Used Lapweld Steel Casing
3,010′—5½, 17#
1,410′—5½, 20#
2,603′—7″, 20#
1,595′—8⅝, 32#

Above listed material in stock—Duncan, Oklahoma.

ROCK ISLAND OIL & REFINING CO., INC.
335 West Lewis Street Wichita, Kansas
Phone 7-3325

EQUIPMENT FOR SALE

FOR SALE: Wilson Super Spudder—Double drum, double pole mast, complete with walk ways, roof, wings, and fully skidded—Good Wire—Priced to sell. Wilson Mogul Drawworks, powered by 145 GK Waukesha—Portable derrick—Wilson Snyder 6 x 16 pump, powered by WAK Waukesha—4½″ Drill Pipe, Traveling Block, Swivel, 4¼″ x 40′ Kelly, BJ Tongs, etc.—Priced to sell. Write: T & R Oil Field Machine & Supply Co., Box 98, Carmi, Ill.

FOR SALE: One 55 ft. Steel Telescope heavily reinforced Rig Pole with Bucyrus Head. Brand New. Priced Cheap. Neosho Drilling Co., P.O. Box 265, Chanute, Kansas.

EQUIPMENT WANTED

WANTED
42 Miles of 6⅝″ Line Pipe, 13 or 15#. Wm. M. Hanlon, Box 754, Billings, Montana.

WELL-KNOWN drilling company needs rotary drilling skid unit—6,000′. Must be in good shape and not too old. Mail inventory and full particulars. P.O. Box 26, Tulsa, Oklahoma.

HELP WANTED

WANTED: Refinery Chemist, must have degree in Chemical Engineering, together with 3 to 5 years' Laboratory experience; give complete personal information and salary expected in first letter; location Western Canada. Box C-908, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Oil Treating Engineer to organize and conduct treating program, for major oil company, production operations, with main offices in Oklahoma City. Should have adequate production background and previous treating experience. Write giving detailed experience, education, references, salary requirements, age, and personal details. Replies confidential. Box C-914, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Geologist: wanted as assistant professor of geology, to teach mineralogy, petrology, structure, petroleum, economic, micropaleontology. Experience in Illinois basin preferred. Write Dr. F. C. MacKnight, Geology Department, Evansville College, Evansville, Indiana.

NEW Directory of 140 large oil companies in U.S. 10 of them having foreign operations, showing where to apply for jobs. Price $5.00 postpaid. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (our 29th year).

MATERIALS ENGINEER—Experience in listing, expediting, and storehouse control of material, with oil refinery maintenance or construction background. Write, giving training, experience, references and personal details to: P. O. Box 2094, Billings, Montana.

ASSISTANT SALES MANAGER: Large midwest independent needs young aggressive man with good experience in petroleum sales for position of assistant sales manager. Expanding operations require high-type executive for this permanent position. In replying, give full details including age, education, and salary required. Replies confidential. Box C-900, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING

During the next several months we will increase our Engineering Organization engaged in the design of Oil Refinery Plants and Power Plants. Location Cleveland, Ohio. The men we need should be qualified as draftsmen, designers, checkers or in higher engineering skills on design of piping, instrumentation, pressure vessels, structural steel, concrete, mechanical or electrical. For presenting your qualifications and prompt consideration, write to us for application form.

ARTHUR G. McKEE & CO.
2300 Chester Ave., Cleveland 1, Ohio

HELP WANTED

PURCHASING AGENT: Familiarity with refining equipment and specifications. Write, giving training, experience, references and personal details to: P.O. Box 2094, Billings, Montana.

WANTED: Experienced oil field equipment salesman with practical experience background on spudders and cable tools for sales position with nationally known oil field equipment manufacturer. Box C-904, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S REPRESENTATIVE wanted to sell oil field drilling equipment in the Gulf Coast area. Write Box C-906, The Oil and Gas Journal, Tulsa, Oklahoma, giving complete information including present lines and references.

WANTED: Experienced salesman to call on the oil country trade to solicit electrical business. Prefer married man 30 to 35 years old. M.E. or E.E. graduate or equivalent experience. This is an opportunity for a man who is willing to work, salary commensurate with ability, plus bonus and expenses. Please reply to Box C-903, The Oil and Gas Journal, Tulsa, Oklahoma.

WELDING and Boilermaker Foreman—Must have experience in these trades and in supervising. Oil refinery experience preferred. Write, giving training, experience, references and personal details to: P. O. Box 2094, Billings, Montana.

WANTED
JUNIOR APPRAISAL ENGINEER

To assist Insurance Department of independent oil company set up equipment records and establish insurable values for oil production, refining, transportation and marketing properties. Applicants should have an engineering degree and at least one year's practical appraisal experience. Location — Middle West. Limited amount of traveling required. Good opportunity for continuous work and advancement.

Box C-891, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

YOUNG EXECUTIVE ENGINEER, age 35, congenial, ambitious, energetic, M.S. in Ch.E., Texas registered professional engineer. Varied experience including chemist, research engineer, design and construction engineer, plant superintendent of large and small plants, independent pipeline contractor. Desires high type sales or administrative position. Position should be such as to yield a great deal of personal satisfaction as well as considerably above average income. Now located East Texas, Gulf Coast or Mid-Continent area preferred. Available immediately. Box C-896, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 16 years' experience in the Mid-Continent and Gulf areas. Thoroughly capable of assuming complete charge of the drilling, completion and production of oil. Considerable experience in division offices in managerial capacity. Have also a degree in Geology. Box C-887, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER: B.S. Chemical Engineering. Experienced in process engineering and plant operations. Extensive Fluid Catalytic Cracking experience. Well versed in yields and refinery balances. Desire permanent position in process engineering or operations. Midwest or southwest location preferred. Presently employed. Box C-894, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPABLE Supply Man. Twenty years' experience two Major supply companies. Mid-Continent Area. Desires connection with independent supplier on profit sharing basis. Write Box C-901, Oil & Gas Journal, Tulsa, Okla.

ENGINEER, experienced domestic and foreign and as drilling, production and operations superintendent. Fluent Spanish with knowledge of others. Age 36. Desire responsible connection foreign or domestic. Box C-910, The Oil and Gas Journal, Tulsa, Okla.

SITUATIONS WANTED

CONTROLLER-TREASURER
Experience with independent oil company in production, refining, marketing accounting, taxes and finance; presently employed; desire change. Box C-885, The Oil and Gas Journal, Tulsa, Oklahoma.

COLLEGE GRADUATE: 15 years' field experience. Supervision of rotary and cable tool drilling, well completions, and producing operations. Several years scouting, leasing and title curative work. Age 36. Desire permanent connection having sound future. Box C-888, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: B.S. with seven years' experience in Gulf Coast and Venezuela. Desires domestic position. Age 31, married. Box C-907, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL Engineer, 3 years production research experience with field and laboratory testing gas-condensate reservoirs. Available immediately. Box C-916, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG Sales Executive, age 35, experienced throughout oil industry since 1934. Wide acquaintance drilling contractors, oil producers and refineries. Past experience from specialty salesman to district manager to sales manager and 1½ years as purchasing agent. Sober, trustworthy, schooled and trained as petroleum engineer and sales engineer. Best of references. Available immediately. Prefer Illinois district. Box C-912, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY Superintendent, Registered Engineer 25 years experience in refinery operation, design, construction. Proficient in rehabilitating, adapting available materials, and broad knowledge of petroleums. Box C-915, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT OPERATOR: Shift Foreman, 18 years varied experience covering petroleum and chemical field desires connection with growing concern. Box C-909, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer: 7 yrs. experience drilling and production, Mid-Continent and Gulf Coast, past 2 yrs. in supervisory capacity desires position with an active oil company. Box C-911, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT-AUDITOR: 14 years' diversified Accounting and Tax experience, principally in Oil Industry. C.P.A. presently employed, desire change. Box C-905, The Oil and Gas Journal, Tulsa, Oklahoma.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

RANCHES AND FARM LANDS

1,000-ACRE RANCH
16 miles of Colo. Springs, with wonderful mountain view. Fine 4 bedroom house in excellent condition inside and out, fine sheds, corrals, other buildings. Good water at 6 to 14 feet, with excellent spring in pasture. Most all could be farmed. Some alfalfa. A wonderful home for a discriminating buyer. About $20,000 improvement. The price is $40,000, with terms. For full information write Guy Speakman, 21 S. Nevada, Colo. Springs, Colo., % Wood & Waters.

SALES REPRESENTATIVE

SALES REPRESENTATIVE well established in Tulsa, desires an additional well-known marketing or engineering account for the State of Oklahoma. Box C-886, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATION

Warehouse Facilities, Beaumont, Texas
Reliable representation, 25 years successful experience. Sales to Refineries, Pipe Lines, Chemical Plants. Excellent Warehouse with spur track. Handle equipment or supplies on distributor or consigned basis. Box C-890, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

NON-PRODUCING Royalty in Beckham, Washita, Roger-Mills, Ellis, Dewey, and Woodward Counties, Oklahoma. Ten year leases in 20, 40, and 80-acre tracts. Price from $20.00 per acre up. Open for an assignment of royalty, leases, or blocks, anywhere in Oklahoma or Kansas. W. D. McCoy, 810 Ritz Bldg., Tulsa, Oklahoma.

ROYALTIES IN HOT AREAS!
Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

LEASE AND DRILLING BLOCKS

WANT DEVELOPMENT DEALS
Prefer proven or semi-proven or farmouts. Might consider wildcats on good geological information. Have million dollars to invest this year and more on any production deal in Mid-Continent. Harry Hines, 609-11 Gulf States Bldg., Dallas, Texas.

FOR SALE: New 86 acre lease, Shelby County, Texas, one mile from production, deep test now going down. Price $6.00 per acre. C. A. Parker, Box 451, Center, Texas.

FOR SALE: Oil and Gas Lease, 1880 acres, Quealy Dome, Albany County, Wyoming. P. O. Box 516, Laramie, Wyoming.

SOUTHEASTERN NEW MEXICO
Oil leases for sale near latest outstanding Ellenburger discovery. Grant Keyes, 311 White Bldg., Roswell, New Mexico.

RED HOT 37-Acre Lease, joins 3,500 barrel production per month and a new well just came in making 36 barrels every two hours. Want oil override. John A. Damron, Albany, Kentucky.

WILL BUY producing gas properties or oil production 20 bbls. up. Leases with space for additional development preferred. Any state. Box C-893, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Oil and Gas Leases and drilling propositions in shallow territory of Allen, Simpson, and Warren Counties, Kentucky. W. P. Harley, Bowling Green, Ky.

OIL LEASES for sale in large, small or medium size blocks in Colorado, Wyoming, New Mexico, Montana, Arizona. Wholesale or retail. Write for descriptive list. Dyer-OJ, 1835 Champa, Denver, Colorado.

LEASES ROYALTIES
PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma, Louisiana and Illinois
Inquiries Invited
B. D. BUCKLEY
60 Broadview Drive, Clayton (5), St. Louis, Missouri

SERVICES

RADAR Surveys: Latest mobile radar equipment installed in Jeep and modified for oil exploration. Locates and outlines areas of possible oil saturation. Defines faults. For further information write Geotronic Laboratories, 335 So. Sycamore St., Centralia, Illinois.

PECOS DRILLING COMPANY, INC.
DRILLING CONTRACTORS "Cable Tools"
302 CARPER BUILDING, TELEPHONE 649
ARTESIA, NEW MEXICO

MANUFACTURER WANTED

INVENTOR has new flowing device for Oil Wells designed to preserve gas. Manufacturer needed on Royalty basis. John Turmes, 3824 Rusty Dell, Fort Worth, Texas.

REAL ESTATE

FOR SALE
CATTLE RANCHES IN MEXICO:
(1) Run 4500 head—$300,000
(2) Run 4000 head—$220,000
(3) Run 1500 head—$75,000
Also lease-partnership in ranch running 4000 head for investment of about $70,000. Opportunity for remarkable income. CATTLE RANCH, Arizona. Run 500-700 head, abundant water, two houses. Main home one mile from an active town. $150,000 including cattle. SUE HOFFMAN, Realtor, Tombstone, Ariz.

WANTED

WANTED PARTNERS ready to invest up to twenty thousand dollars in big mining estate, Honduras, C. A., comprising numerous rich mines and placers. For information: write J. L. Cadrin, 716 Nolen Street, Kilgore, Texas.

GASOLINE Connection Wanted: Wish to contract for six million gallons a month for 1 year at market price. No brokers. Will deal with principals only. P.O. Box 481, Beaumont, Texas.

FOR SALE

TRUCK LETTERING AND TRADEMARK DECALS made for your trucks and equiqment. Easy to apply, uniform, distinctive, economical for small or large needs. Write for catalog. MATHEWS COMPANY, 827 S. Harvey, Oak Park, Illinois.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 113 South Cincinnati, Tulsa 3, Oklahoma

REPRESENTATIVES WANTED

MANUFACTURERS' Representatives: to represent manufacturer of proved liquid level gauges to oil industry, will meet all competition, write full details: E. Townill, Suite 210, 2349 West Devon Avenue, Chicago 45, Illinois.

Texas Board Opposes Tidelands Compromise

AUSTIN.—The Texas School Land Board last week went on record as opposing a compromise on the tideland question.

Gov. Beauford H. Jester, Atty. Gen. Price Daniel, and Land Commissioner Bascom Giles said in a joint statement that benefits from efficient state management of Texas school lands have far exceeded those for comparable areas under federal control.

Texas has averaged $20 an acre for its leases compared with 25 cents an acre for similar federal leases, the three officials pointed out.

Appalachian Geological Group Will Meet May 13

A joint meeting, sponsored by Appalachian Geological Society, in cooperation with Engineers' Society of Western Pennsylvania, oil and gas section, and the Pittsburgh Geological Society, will be held May 13-14 at Morgantown, W. Va.

Highlight of the 2-day meeting will be a field trip to Terra Alta in the Portland district of Preston County, where recent drilling activity has resulted in five producing gas wells on the Briery Mountain anticline.

Gordon Petroleum Sessions Scheduled for June 20-24

A 5-day session on petroleum will be held on June 20-24 at Colby Junior College, New London, N. H., as a part of the Gordon Research Conference sponsored by the American Association for the Advancement of Science.

The conferences, designed to stimulate research in universities, research foundations and industrial laboratories, will feature lectures and open discussions.

Papers and speakers scheduled for the petroleum sessions are as follows:

"Theory and Practice of Fractionation of Liquids by Adsorption," Beveridge J. Mair, James W. Westhaver, and F. D. Rossini; "Hydrocarbon Thermodynamics," B. H. Sage; "Fundamental Aspects of Modern Combustion Research," F. J. McClure; "Use of Entrophy in Chemical Engineering," Manson Benedict; "Petroleum Lubricant Additives," C. F. Prutton; "Theory and Phenomena of Micelle Formation," P. Debye.

"The Nature of the Silica-Alumina Cracking Catalyst," M. W. Tamele and Otto Beeck; "Civilization's Future Enery Needs," P. D. Foote; "The Active Principle of Petroleum Cracking Catalysts," A. G. Oblad, T. H. Milliken, and G. A. Mills.

John R. Bowman is chairman of the petroleum sessions and C. C. Price vice chairmen.

Humble to Set Expenditure Record in 1949, Baker Says

HOUSTON.—Although net income of Humble Oil & Refining Co. for 1949 will be lower than 1948, present plans call for capital expenditures larger than the record of $138,302,000 in 1948, Hines H. Baker, president, told stockholders at their annual meeting Monday.

The company's crude-oil production for the first quarter of 1949 was down 12 per cent to 324,400 bbl. daily, Baker said. Refinery runs were down 9 per cent to 227,300 bbl. per day, and its pipe-line deliveries decreased 17 per cent to 630,000 bbl. daily. It is expected that an increase in demand will require a higher level of operation in the last half of the year.

Stockholders were told that the company has already invested more than $25,000,000 in the search for oil on the Continental Shelf and is currently operating seven rigs in the area at a cost of about $15,000,000 per year. To date the company has discovered four fields off the coast of Louisiana and now is operating four producing oil wells and one gas well.

Steel Allocation Cut For Tanker Building

WASHINGTON. — Steel allocations for construction and repair of tankers, set at 40,380 tons a month under an allocation agreement negotiated by the Office of Industry Cooperation in February, will be reduced to 31,551 tons a month in June.

The cut in the allocation, one of several agreed upon in consultation with steel producers, consumer participants, and interested government agencies, was made to keep it in line with actual requirements evidenced by certified orders placed against the quantity made available for the program.

The purpose of the cuts, which aggregated approximately 150,000 tons, is to prevent the tying up of steel products not required by the several allocation programs and thus make them available for other uses.

OIC explained that the cuts are in the monthly amounts only and do not change the original amounts that the steel industry has agreed to provide for each plan.

With the general easing of the steel situation, cutbackr in drilling, and other developments, no further efforts are being made to induce the steel industry to enter into an agreement covering tubular goods. Such agreements were resisted by the steel representatives in the past on the ground that the industry was producing as much tubular goods as facilities permitted and was confident it could meet the needs of the oil industry without a formal commitment.

FCC Revamps Frequency Allocations on Radio Use

WASHINGTON.—The Federal Communications Commission revamped its frequency allocations for industrial and other specialized radio services last week, assigning the frequencies to be used by petroleum radio service.

In a general revision of its rules, the commission held that licenses for petroleum radio service may be obtained by a person who is engaged in prospecting for, producing, collecting, refining, or transporting by means of pipe lines petroleum or petroleum products, including natural gas, or a nonprofit corporation or association organized for the purpose of furnishing a radio-communication service solely to persons actually engaged in such activities, on a nonprofit cost-sharing basis.

The new schedule provides 30 frequencies between 25.02 and 49.18 mc. for base and mobile stations in the petroleum radio service for exclusive use, and 21 other frequencies in various parts of the spectrum for use on a shared basis with other services.

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CALENDAR

May

American Petroleum Institute, division of production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, Calif., May 12-13.

Instrument Society of America, annual spring meeting, Royal York Hotel, Toronto, Canada, May 12-13.

Oil-Heat Institute of America, national oil-heat exposition and annual convention, Boston, Mass., May 16-20.

American Petroleum Institute, Lubrication Committee, Broadmoor Hotel, Colorado Springs, Colo., May 22-23.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 23-25.

American Association of Oilwell Drilling Contractors' fourth annual drilling industry safety clinic, May 24-25, Baker Hotel, Dallas.

Society of Automotive Engineers, diesel engines, Engineering Societies Building New York, May 26.

American Petroleum Institute, Rocky Mountain district, Gladstone Hotel, Casper Wyo., May 26-27.

Natural Gas and Petroleum Association of Canada, annual meeting, Hotel London London, Ont., Canada, May 26-27.

Fourth Annual Short Course in Gas Technology, sponsored by Southern Gas Association, Texas A. & I. College, Kingsville, May 30-June 1.

June

Petroleum Equipment Supplier's Association, annual meeting Broadmoor Hotel, Colorado Springs, Colo., June 5-7.

National Oil Scouts and Land Men's Association, annual meeting, Shamrock Hotel, Houston, June 9-11.

Canadian Gas Association, annual convention, Bigwin Inn, Lake of Bays, Ont., Canada, June 16-20.

American Society for Testing Materials, fifty-second annual meeting, Hotel Chalfonte Haddon Hall, Atlantic City, N. J., June 17-July 1.

Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh, Pa., June 16-17.

Kentucky Oil & Gas Association, annual meeting, Hotel Lafayette, Hotel Phoenix, Lexington, Ky., June 23-24.

American Society of Mechanical Engineers, semiannual meeting, University of California Extension Building, San Francisco, June 27-30.

August

United Nations Scientific Conference on the Conservation and Utilization of Resources, U. N. Interim Headquarters, Lake Success, N. Y., August 17-September 6.

September

Instrument Society of America, annual meeting and exhibit, Municipal Auditorium, St. Louis, September 12-16.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 14-16.

American Gas Association, annual convention, Chicago, September 17-20.

American Institute of Chemical Engineers, Mt. Royal Hotel, Montreal, September 18-20.

American Association of Oilwell Drilling Contractors, ninth annual meeting, Baker Hotel, Dallas, September 19-21.

National Butane-Propane Association, Jefferson Hotel, St. Louis, September 19-21.

American Institute of Mining and Metallurgical Engineers, regional meeting, Neil House, Columbus, Ohio, September 25-28.

American Society of Mechanical Engineers, fall meeting, Erie, Pa., September 26-30.

October

American Society of Mechanical Engineers, petroleum division, 1949 Petroleum Mechanical Engineering Conference, Biltmore Hotel, Oklahoma City, October 2-5

National Association of Corrosion Engineers, South-Central Regional Division, annual meeting, Adolphus Hotel, Dallas, October 3-4.

National Lubrication Grease Institute, Hotel Roosevelt, New Orleans, La., October 3-5.

American Institute of Mining & Metallurgical Engineers, Petroleum Branch, fall meeting, Plaza Hotel, San Antonio, October 5-7.

Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston, October 13-14.

American Gas Association, annual convention, Chicago, October 17-20.

American Institute of Mining & Metallurgical Engineers, Petroleum Branch, fall meeting, Elk's Club, Los Angeles, October 20-21.

Independent Natural Gas Association of America, annual meeting, Baker Hotel, Dallas, October 31.

NOMADS

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday each month, Jonathan Club.

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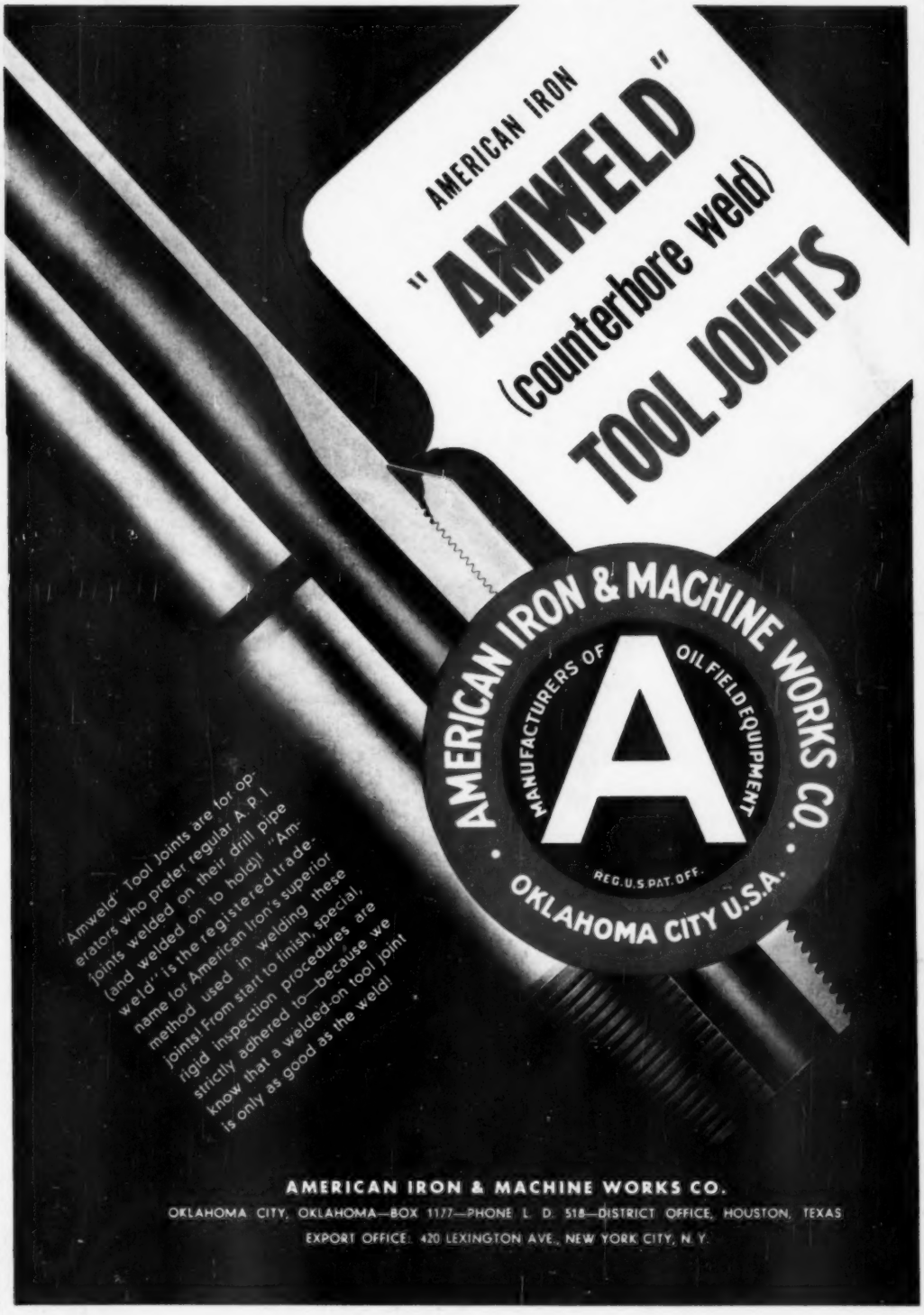
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